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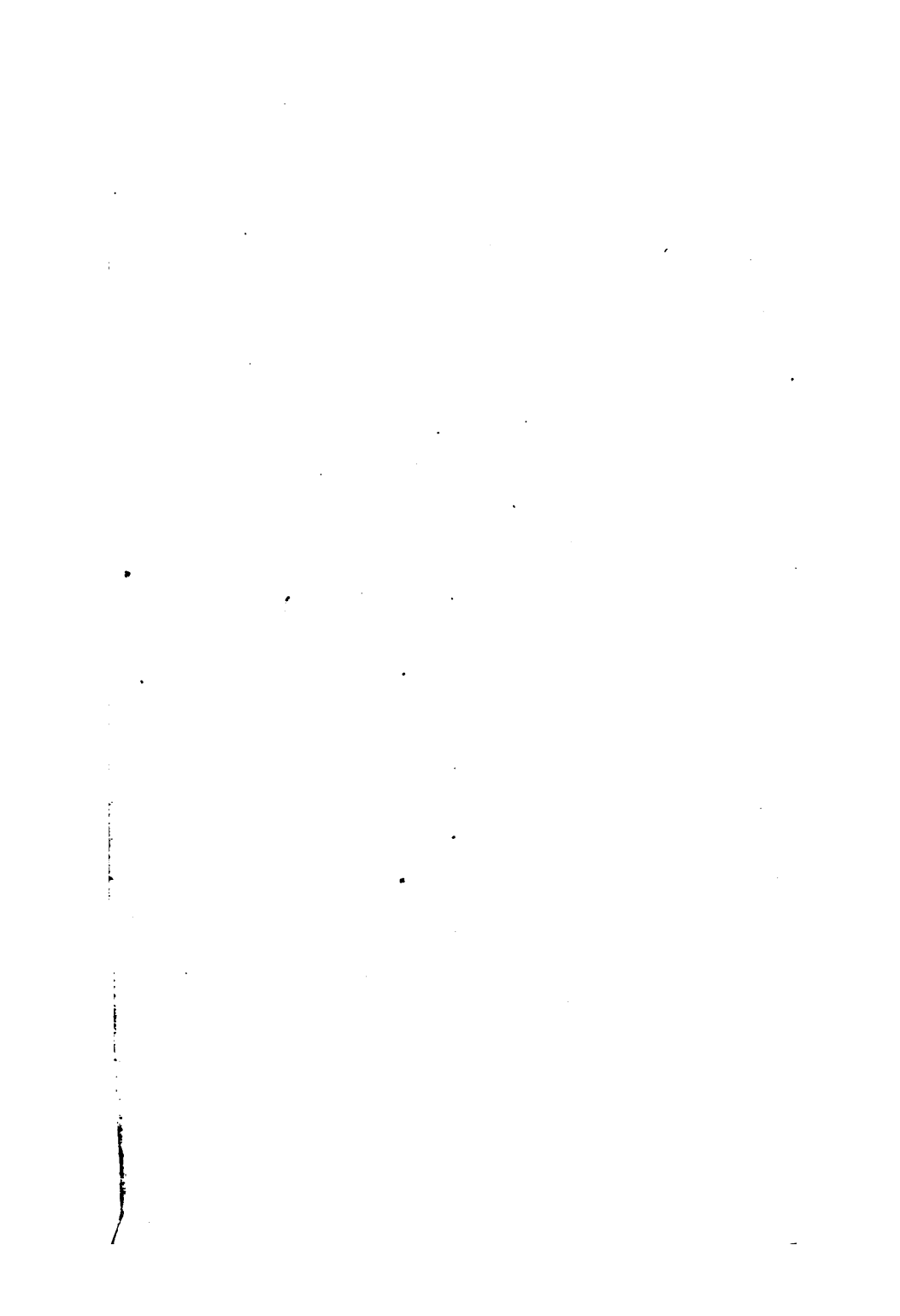


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ADDITION.

(67, page 25.)

Ex. 3. <i>Ans.</i> 1982738.	Ex. 4. <i>Ans.</i> 435058.
Ex. 5. <i>Ans.</i> 3189.	Ex. 6. <i>Ans.</i> 289142.
Ex. 7. <i>Ans.</i> 415184.	Ex. 12. <i>Ans.</i> 3001623.
Ex. 13. <i>Ans.</i> 16977.	Ex. 16. <i>Ans.</i> 1881.
Ex. 17. <i>Ans.</i> 6076510.	Ex. 20. <i>Ans.</i> 21184000
Ex. 22. <i>Ans.</i> \$1924950.	

ADDING TWO OR MORE COLUMNS AT ONE OPERATION

(68, page 28.)

Ex. 5. Number of churches,	35887;
“ “ persons accommodated,	13847902;
Value of church property,	\$85774659
Ex. 6. Pounds of butter,	312625306;
“ “ cheese,	105735893;
“ “ wool,	52516961;
Bushels of wheat,	100485844.

SUBTRACTION.

(75, page 31.)

Ex. 5. <i>Ans.</i> 174333815.	Ex. 6. <i>Ans.</i> 2361650877.
Ex. 7. <i>Ans.</i> 86602389426.	Ex. 8. <i>Ans.</i> 9000989311

(25—31)

Ex. 10. *Ans.* 86 years.Ex. 13. *Ans.* \$44656513Ex. 15. *Ans.* 2121108 square miles; 316686286 populationEx. 20. *Ans.* 2657048.

TWO OR MORE SUBTRAHENDS.

(76, page 34.)

Ex. 5. 4568

1320

275

3202658 *Ans.*Ex. 6. $4756 + 575 + 140 + 84 = 5555$ 1200

750

963509 *Ans*

Ex. 7. \$15760

2175

3794

4587\$5204 *Ans.*

Ex. 8. \$75860

45640

25175

\$5045 *Ans*

Ex. 9. 20000

110007000*Ans.* 2000 square miles.

Ex. 10. 398470

15754814342997493 *Ans*

Ex. 11 \$61857088

52889800234000\$8233288 *Ans.*Ex. 12. $\$5760 + \$3575 = \$9335$ 27464632\$1957 *Ans*

MULTIPLICATION.

7

Ex 13. 643166

65038

114624

Ans. 463504

Ex. 14 \$8186793

5700314

904299

\$1582180 *Ans*

Ex. 15. \$12722470

7821556

424497

2355016

Ans. \$2121401

MULTIPLICATION.

(85, page 38.)

Ex. 7 *Ans.* 43506216.

Ex. 8. *Ans.* 48288053.

Ex. 16 *Ans.* 24500.

Ex. 19. *Ans.* \$31647000

Ex 20. *Ans.* \$909000.

POWERS OF NUMBERS.

(91, page 39.)

Ex. 1. $72 \times 72 = 5184$.

Ex. 2. $12 \times 12 \times 12 \times 12 \times 12 = 248832$.

Ex. 3. $25 \times 25 \times 25 = 15625$.

Ex. 4. $7 \times 7 \times 7 \times 7 \times 7 \times 7 \times 7 = 823543$

Ex. 5. $19 \times 19 \times 19 \times 19 = 130321$.

Ex. 6. $3 \times 3 \times 3 \times 3 \times 3 \times 3 = 729$

(34—40)

Ex. 7. *Ans.* $9^5=59049$; $11^3=1331$; $18^2=324$; $125^4=244140625$; $786^2=617796$; $94^6=689869781056$; $100^4=100000000$; $17^3=4913$; $251^5=996250626251$.

Ex. 8. $8^2=512$; $15^2=225$; and $512 \times 225=115200$, *Ans.*

Ex. 9. $25^2=625$; $3^4=81$; and $625 \times 81=50625$, *Ans.*

Ex. 10. $7^3 \times 200=68600$; $4^4 \times 11^2=30976$; and $68600-30976=37624$, *Ans.*

CONTRACTIONS IN MULTIPLICATION.

(98, page 42.)

Ex. 1. $736 \times 6 \times 4=17664$, *Ans.*

Ex. 2. $538 \times 8 \times 7=30128$, *Ans.*

Ex. 3. $27865 \times 7 \times 3 \times 4$, or $27865 \times 7 \times 12=2840660$, *Ans.*

Ex. 4. $7856 \times 4 \times 4 \times 3 \times 3$, or $7856 \times 12 \times 12=1131264$, *Ans.*

Ex. 5. $\$185 \times 8 \times 7=\$10360$, *Ans.*

Ex. 6. $17740872 \times 8 \times 12=1703123712$ cubio feet, *Ans.*

(99.)

Ex. 3. *Ans.* 50000 dollars. **Ex. 4.** *Ans.* 100000000000

(100, page 43.)

Ex. 3. *Ans.* 10350000. **Ex. 5.** *Ans.* 192128000

(102, page 44.)

Ex. 1. 5784

246

34704

188816

1422864 *Ans.*

Ex. 2. 3785

721

26495

79485

2728985 *Ans.*

(40—44)

MULTIPLICATION.

9

Ex. 3. 472856

54918

4255704

8511408

25584224

25968305808 Ans

Ex. 5. 578042

24816

4584336

9168672

18753008

14220610272 Ans.

Ex. 7. 48725652

5187914

393580868

787061736

306079564

612159128

218628260

226847922169928 Ans

Ex. 9. 2703605

4249784

18925235

132476645

118551410

227102820

11489737271320 Ans

Ex. 4. 43785

7153

131355

656775

306495

313194105 Ans

Ex. 6. 78563721

127369

707073489

2828293956

2121220467

78563721

10006582580049 Ans

Ex. 8. 3578426785

64532164

14813707140

57254828560

114509657120

17892133925

229019314240

230923624151612740 Ans

Ex. 10. 9462108

16824

75696864

227090592

151393728

159190504992 Ans

(44, 45)

EXAMPLES COMBINING THE PRECEDING RULES

(Page 45.)

Ex. 1. $\$28 \times 175 = \$4900$; $\$37 \times 320 = \$11840$; $\$4900 + \$11840 = \$16740$, *Ans.*

Ex. 2. $\$1200 - (\$364 + \$275 + \$150 + \$187) = \$224$; and $\$224 \times 5 = \$1120$, *Ans.*

Ex. 3. $29 + 32 = 61$; $61 \times 17 = 1037$ miles, *Ans.*

Ex. 4. $\$34 \times 127 = \$4318$; $\$47 \times 97 = \$4559$; and $\$4318 + \$4559 = \$8877$, cost ; $127 + 97 = 224$; $\$40 \times 224 = \$8960$ sold for ; $\$8960 - \$8877 = \$83$, profit, *Ans.*

Ex. 5. $77 + 56 = 133$; $675 - 133 = 542$, multiplicand. $3 \times 156 = 468$; $214 - 28 = 186$; $468 - 186 = 282$, multiplier. $542 \times 282 = 152844$, *Ans.*

Ex. 6. $37 + 50 = 87$; $87 \times 6 = 522$; $98 + 522 = 620$, multiplicand. $64 - 50 = 14$; $14 \times 5 = 70$; $70 - 10 = 60$, multiplier. $620 \times 60 = 37200$, *Ans.*

Ex. 7. $14 \times 25 = 350$; $9 \times 36 = 324$; $350 - 324 + 4324 = 4350$, multiplicand. $280 - 112 = 168$; $376 + 42 = 418$; $418 \times 4 = 1672$; $168 + 1672 = 1840$, multiplier. $4350 \times 1840 = 8004000$, *Ans.*

Ex. 8. $\$2751 \times 29967 = \$82439217$

$\$5030 \times 23905 = \$120242150$

$\$37802933$ *Ans.*

Ex. 9. $1449075 \times 203 = 294162225$ acres cultivated ; $1922890880 - 294162225 = 1628728655$ acres, *Ans.*

Ex. 10. $\$2258 + \$105 = \$2363$, valuation per farm ;

$\$2363 \times 1449075 = \$3424164225$, *Ans.*

Ex. 11. $2^4 \times 5^5 = 50000$; $7^3 = 343$;

$50000 - 343 = 49657$, *Ans.*

(45, 46)

- Ex. 9. *Ans.* 7198. Ex. 10. *Ans.* 7071.
 Ex. 11. *Ans.* 15607. Ex. 12. *Ans.* $48340\frac{7}{232}$
 Ex. 13. *Ans.* $125397\frac{194}{213}$. Ex. 14. *Ans.* $5479\frac{5219}{3377}$.
 Ex. 15. *Ans.* $2084768\frac{1255}{3359}$. Ex. 16. *Ans.* $2478\frac{199}{281}$.
 Ex. 17. *Ans.* $5851\frac{342}{357}$. Ex. 18. *Ans.* $591862\frac{401}{54001}$
 Ex. 19. *Ans.* $15395919\frac{2214}{37149}$. Ex. 20. *Ans.* $901\frac{5909}{54001}$
 Ex. 21. $\$147675 \div 365 = \$404\frac{215}{365}$ *Ans.*
 Ex. 22. $\$30732518 \div 556 = \$55274\frac{174}{556}$ *Ans.*
 Ex. 23. $\$5572470 \div 287 = \$19416\frac{76}{237}$ *Ans.*
 Ex. 24. $\$8186793 \div 27977 = \$292\frac{17509}{7977}$ *Ans.*

ABBREVIATED LONG DIVISION.

(112 page 51.)

- Ex. 1. 204)77112(378 *Ans.*
 159
 163
 Ex. 2. 72)65664(912 *Ans.*
 8
 14
 Ex. 3. 209)7913576(37864 *Ans.*
 164
 180
 133
 83
 Ex. 4. 698)6636584(9508 *Ans.*
 354
 55
 Ex. 5. 8903)4024156(452 *Ans.*
 4629
 1780
 (49-51)

DIVISION.

13

Ex. 6. 6791)760592(112 Ans.

814

1358

Ex. 7. 25203)101443929(4025 ~~1854~~ Ans

631

12786

1854

Ex. 8. 269181)1246038849(4629 Ans.

169314

78062

242262

Ex. 9. 56240)2318922(41 ~~11983~~ Ans.

6932

13082

Ex. 10. 17300)1454900(84 ~~1700~~ Ans.

7090

1700

CONTRACTIONS IN DIVISION.

(121 page 57.)

Ex 1 3(485

5)145

29 Ans

Ex. 2. 7)4256

8)608

76 Ans

Ex 3. 9)17856

8)1984

248 Ans.

Ex. 4. 2)15288

8)7644

7)2548

364 Ans

Ex. 5. $8)972552$

$$\begin{array}{r} \hline 7)121569 \\ \hline \end{array}$$

$$\begin{array}{r} \hline 8)17367 \\ \hline \end{array}$$

5789 Ans.

Ex. 6. $9)526050$

$$\begin{array}{r} \hline 7)58450 \\ \hline \end{array}$$

$$\begin{array}{r} \hline 2)8350 \\ \hline \end{array}$$

4175 Ans.

Ex. 7. $7)612360$

$$\begin{array}{r} \hline 5)87480 \\ \hline \end{array}$$

$$\begin{array}{r} \hline 8)17496 \\ \hline \end{array}$$

5832 Ans.

Ex. 8. $8)553$

$$\begin{array}{r} \hline 5)184 \text{ } 1 \\ \hline \end{array}$$

Quotient, $36 \text{ . . } 4 \times 3 = 12$

13, remainder.

Ex. 9. $3)10188$

$$\begin{array}{r} \hline 5)3394 \text{ } 1 \\ \hline \end{array}$$

$$\begin{array}{r} \hline 7)678 \text{ . . . } 4 \times 3 = 12 \\ \hline \end{array}$$

Quotient, $96 \text{ . } 6 \times 5 \times 3 = 90$

108, remainder.

Ex. 10. $2)10197$

$$\begin{array}{r} \hline 3)5098 \text{ } 1 \\ \hline \end{array}$$

$$\begin{array}{r} \hline 4)1699 \text{ } 1 \times 2 = 2 \\ \hline \end{array}$$

$$\begin{array}{r} \hline 5)424 \text{ . . . } 3 \times 3 \times 2 = 18 \\ \hline \end{array}$$

Quotient, $54 \text{ . } 4 \times 4 \times 3 \times 2 = 96$

117, remainder

Ex. 11. 3)29792

$$\begin{array}{r} 8)9980 \end{array} \text{ } 2$$

$$\begin{array}{r} 6)1241 \end{array} \text{ } 2 \times 3 = 6$$

$$\text{Quotient, } 206 \text{ . . . } 5 \times 8 \times 3 = 120$$

 128, remainder

Ex. 12 4)73522

$$\begin{array}{r} 6)18880 \end{array} \text{ } 2$$

$$\begin{array}{r} 7)3063 \end{array} \text{ } 2 \times 4 = 8$$

$$\text{Quotient, } 437 \text{ . . . } 4 \times 6 \times 4 = 96$$

 106, remainder

Ex. 13. 3)63844

$$\begin{array}{r} 5)21281 \end{array} \text{ } 1$$

$$\begin{array}{r} 9)4256 \end{array} \text{ } 1 \times 3 = 3$$

$$\text{Quotient, } 472 \text{ . . . } 8 \times 5 \times 3 = 120$$

 124, remainder

Ex 14. 2)386639

$$\begin{array}{r} 3)193319 \end{array} \text{ } 1$$

$$\begin{array}{r} 4)64489 \end{array} \text{ } 2 \times 2 = 4$$

$$\begin{array}{r} 5)16109 \end{array} \text{ } 3 \times 3 \times 2 = 18$$

$$\begin{array}{r} 6)3221 \end{array} \text{ . . . } 4 \times 4 \times 3 \times 2 = 96$$

$$\text{Quotient, } 536 \text{ } 5 \times 5 \times 4 \times 3 \times 2 = 600$$

 719, remainder

Ex. 15. 4)734514

$$\begin{array}{r} \overline{6)183628} \text{ } 2 \end{array}$$

$$\begin{array}{r} \overline{7)80604} \text{ } 4 \times 4 = 16 \end{array}$$

Quotient, 4372 18, remainder

Ex. 16. 9)636388

$$\begin{array}{r} \overline{9)70709} \text{ } 7 \end{array}$$

$$\begin{array}{r} \overline{9)7856} \text{ } 5 \times 9 = 45 \end{array}$$

Quotient, 872 8 \times 9 \times 9 = 648
700, remainder

Ex. 17. 5)4619

$$\begin{array}{r} \overline{5)928} \text{ } 4 \end{array}$$

$$\begin{array}{r} \overline{5)184} \text{ } 3 \times 5 = 15 \end{array}$$

Quotient, 36 4 \times 5 \times 5 = 100
119, remainder

Ex. 18. 8)116428

$$\begin{array}{r} \overline{7)88807} \text{ } 2 \end{array}$$

$$\begin{array}{r} \overline{7)5548} \text{ } 6 \times 8 = 18 \end{array}$$

$$\begin{array}{r} \overline{8)791} \text{ } 6 \times 7 \times 8 = 126 \end{array}$$

$$\begin{array}{r} \overline{9)98} \text{ } 7 \times 7 \times 7 \times 3 = 1029 \end{array}$$

Quotient, 10 8 \times 8 \times 7 \times 7 \times 3 = 9408
10583, remainder

Ex. 19. 5)79500

5)15900

5)3180

7)636

7)90 $6 \times 5 \times 5 \times 5 = 750$

Quotient, 12 $6 \times 7 \times 5 \times 5 \times 5 = 5250$

6000, remainder

(122, page 58.)

Ex 2. Ans. $79\frac{82}{100}$.

Ex. 4. Ans. $230\frac{1000}{10000}$

(123.)

Ex. 2 Ans. $27\frac{173}{100}$.

Ex. 6. Ans. $8206\frac{148}{100}$

Ex. 7. Ans. 3005.

EXAMPLES COMBINING THE PRECEDING RULES.

(Page 59.)

Ex. 1. $\$4 \times 25 = \$100$; $\$3 \times 36 = \$108$; $\$100 + \$108 =$
 $\$208$; $208 \div 8 = 26$, Ans.

Ex. 2 $\$16 \times 12 = \$192$; $\$13 \times 17 = \$221$; $\$192 + \$221 =$
 $\$413$, cost; $\$18 \times (12 + 17) = \$522$; $\$522 - \$413 =$
 $\$109$, Ans.

Ex 3 $\$2 \times 300 + \$750 = \$1350$, value of produce;
 $\$3 \times 120 + \$90 = \$450$, " " stock;

$\$900 + 25 = \$36$, Ans.

(57-59)

Ex. 4. $450 + (\overline{24-12}) \times 5 = 510$;
 $(90 \div 6) + (\overline{3 \times 11}) - 18 = 30$;
 $510 \div 30 = 17$, *Ans.*

Ex. 5. $648 \times (\overline{3^2 \times 2^3}) \div 9 = 5184$; $2910 \div 15 = 194$; **5184**
 $- 194 = 4990$, dividend; $4375 \div 175 = 25$; $25 \times 4^2 +$
 $3^2 = 409$; $2863 \div 409 = 7$, divisor. Hence, **4990** +
 $7 = 712\frac{1}{2}$, *Ans.*

Ex. 6. $42 \times 34 = 1428$; $107100 \div 1428 = 75$, *Ans.*

Ex. 7. Reversing the fifth operation, $12 \times 24 = 288$;
 reversing the fourth operation, $288 \div 6 = 48$;
 reversing the third operation, $48 + (28 - 16) = 60$;
 reversing the second operation, $60 - (7^2 + 1) = 10$;
 reversing the first operation, $10 \times 45 = 450$, *Ans.*

Ex. 8. $\$60 - \$42 = \$18$; $\$36 \times 50 = \$1800$;
 $1800 \div 18 = 100$ months, *Ans.*

Ex. 9. $251104 \div 472 = 532$, *Ans.*

Ex. 10. $3042^2 = 9253764$, *Ans.*

Ex. 11. $453 \times 307 + 109 = 139180$, *Ans.*

Ex. 12. $\$4 + \$7 = \$11$; $\$1276 \div \$11 = 116$, number of each
 kind; $116 \times 2 = 232$, whole number purchased;
 $\$7 - \$4 = \$3$; $\$3 \times 116 = \$348$, difference in cost

Ex. 13. $\$950 + \$7500 = \$8450$;
 $\$13982686 \div \$8450 = 1654$, and a remainder
 of $\$6386$.

Ex. 14. $\overline{\$54 \times 4300000} \div \$60 = 3870000$ tons, *Ans.*

Ex. 15. $23191876 \div 400 = 57979\frac{219}{100}$. Hence, by this estimate, 57979 persons died.

Ex. 16. $508464 \div 10593 = 48$, *Ans.*
 (59, 60)

- Ex. 17. $\$7680 \div \$64 = 120$, number sold;
 $\$960 \div 120 = \$8$, gained per head;
 $\$64 - \$8 = \$56$, cost per head;
 $\$9800 \div \$56 = 175$, number bought.
- Ex. 18. $\$95 \times 6 + \$1200 = \$1770$; $\$1770 \div 30 = \$59$, *Ans*
- Ex. 19. $36 \times 16 = 576$, number of days' work required;
 $576 \div 24 = 24$, number of days 24 men will require
- Ex. 20. $\$1650 \div 275 = \$6$, cost per barrel;
 $(\$9 - \$6) \times 186 = \$558$, gain.
- Ex. 21. $840 \div (5 + 10 + 15) = 28$, of each kind; hence, $28 \times 3 = 84$, whole number.
- Ex. 22. $\$965 - (\$5 \times 160) = \$165$; $165 \div 3 = 55$ tons, unsold; $160 + 55 = 215$ tons bought.
- Ex. 23. $\$3825 \div \$85 = 45$, number sold;
 $\$7560 \div (\$85 + \$5) = 84$, whole number of horses.
 $(\$7560 + \$945) - \$3825 = \$4680$, to be realized on the remainder.
Hence, $\$4680 \div (84 - 45) = \$120$, *Ans*.
- Ex. 24. $\$22360 + \$1742 = \$24102$, total cost;
 $\$15480 \div \$18 = 860$; $860 \times 2 = 1720$, No. acres,
 $\$22360 \div 1720 = \$13$, original cost per acre.

PROBLEMS IN SIMPLE INTEGRAL NUMBERS.

(127, page 62.)

The following are the *general solutions*:

- Prob. 1. Add the several numbers.
- Prob. 2. Subtract the sum of the given numbers from the sum of all.
- Prob. 3. Add the parts.
- Prob. 4. Subtract the sum of the given parts from the whole
(60—63)

- Prob. 5. Subtract the less from the greater.
- Prob. 6. Subtract the difference from the greater.
- Prob. 7. Add the difference to the less.
- Prob. 8. Subtract the subtrahend from the minuend
- Prob. 9. Subtract the remainder from the minuend
- Prob. 10. Add the subtrahend and remainder.
- Prob. 11. Multiply the numbers together.
- Prob. 12. Divide the product by the given factor.
- Prob. 13. Divide the continued product by the product of the given factors.
- Prob. 14. Multiply the factors together in continued multiplication.
- Prob. 15. Multiply the multiplicand by the multiplier.
- Prob. 16. Divide the product by the multiplicand.
- Prob. 17. Divide the product by the multiplier.
- Prob. 18. Divide each number by the other.
- Prob. 19. Divide the dividend by the divisor.
- Prob. 20. Multiply the divisor and quotient together.
- Prob. 21. Divide the dividend by the quotient.
- Prob. 22. Multiply the divisor by the quotient, and to the product add the remainder.
- Prob. 23. Subtract the remainder from the dividend, and divide the result by the quotient.
- Prob. 24. Multiply the final quotient and the several divisors together.
- Prob. 25. Divide the first dividend by the continued product of the final quotient into all the given divisors.
- Prob. 26. Divide the dividend by the several divisors successively.
- Prob. 27. Add together the numbers comprising each set and subtract the less sum from the greater.

- Prob 28. Multiply together the factors comprising each set, and add the several products.
- Prob. 29. Multiply together the factors comprising each set, and then add the products and given numbers.
- Prob. 30. Multiply together the factors comprising each set, and subtract the less product from the greater.
- Prob 31 Add the product of the given set or sets of factors and the given number or numbers.
- Prob. 32 Subtract the sum of the products of the set or sets of factors which form the less number from the sum of the products of the set or sets of factors which form the greater number.

PROPERTIES OF NUMBERS.

FACTORING.

(142, page 71.)

- Ex. 1. *Ans.* 2, 5, 5, 43. Ex. 2. *Ans.* 3, 5, 163
- Ex. 3. *Ans.* 2, 2, 3, 3, 5, 5, 7.
- Ex. 4. *Ans.* 2, 2, 2, 2, 2, 2, 2, 2, 2, 3, 7.
- Ex. 5. *Ans.* 2, 7, 13, 13. Ex. 6. 2, 2, 2, 5, 5, 5
- Ex. 7. *Ans.* 5, 5, 5, 5, 5, 5, 5, 5.
- Ex. 8. *Ans.* 3, 3, 3, 7, 11, 13, 37.

(144, page 74.)

- Ex. 2. *Ans.* 2, 3, 7, 17, 17, 29. Ex. 3. *Ans.* 13, 17, 31
- Ex. 4. *Ans.* 17, 19, 29. Ex. 5. *Ans.* 2, 11, 19, 487
- Ex. 6. *Ans.* 7, 83, 103. Ex. 7. *Ans.* 97, 103
- Ex. 8. *Ans.* 3, 5, 59, 139.
- Ex. 9. *Ans.* 3, 5, 7, 47, 181.

(64-74)

Ex. 10. *Ans.* 2, 2, 2, 2, 2, 41, 149.

Ex. 11. *Ans.* 7, 11, 37, 79.

Ex. 12. *Ans.* 2, 5, 13, 17, 37.

Ex. 13. *Ans.* 13, 17, 29.

Ex. 14. *Ans.* 2, 2, 2, 3, 17, 19, 23

Ex. 15. *Ans.* 2, 3, 5, 7, 19, 179.

(145, page 76.)

Ex. 1. $120=1 \times 2 \times 2 \times 2 \times 3 \times 5$

1,	2,	4,	8	Combinations of 1 and 2.
3,	6,	12,	24	" " 1, 2, and 3.
5,	10,	20,	40	} " " 1, 2, 3, and 5
15,	30,	60,	120	

Ans. 1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 20, 24, 30, 40, 60, 120

Ex. 2. $84=1 \times 2 \times 2 \times 3 \times 7$

1,	2,	4	Combinations of 1 and 2.
3,	6,	12	" " 1, 2, and 3.
7,	14,	28	} " " 1, 2, 3, and 7.
21,	42,	84	

Ans. 1, 2, 3, 4, 6, 7, 12, 14, 21, 28, 42, 84.

Ex. 3. $100=1 \times 2 \times 2 \times 5 \times 5$

1,	2,	4	Combinations of 1 and 2.
5,	10,	20	} " " 1, 2, and 5
25,	50,	100	

Ans. 1, 2, 4, 5, 10, 20, 25, 50, 100.

Ex. 4. $420=1 \times 2 \times 2 \times 3 \times 5 \times 7$

1,	2,	4	Combinations of 1 and 2.
3,	6,	12	" " 1, 2, and 3.
5,	10,	20	} " " 1, 2, 3, and 5
15,	30,	60	
7,	14,	28	} " " 1, 2, 3, 5, and 7
21,	42,	84	
35,	70,	140	
105,	210,	420	

Ans. { 1, 2, 3, 4, 5, 6, 7, 10, 12, 14, 15, 20, 21, 28,
30, 35, 42, 60, 70, 84, 105, 140, 210, 420

Ex. 5. $1050 = 1 \times 2 \times 5 \times 5 \times 3 \times 7$

1,	5,	25	Combinations of 1 and 5.
2,	10,	50	" " 1, 5, and 2.
3,	15,	75	" " 1, 5, 2, and 3
6,	30,	150	
7,	35,	175	" " 1, 5, 2, 3, and 5
14,	70,	350	
21,	105,	525	
42,	210,	1050	

Ans. { 1, 2, 3, 5, 6, 7, 10, 14, 15, 21, 25, 30, 35, 42,
50, 70, 75, 105, 150, 175, 210, 350, 525, 1050.

GREATEST COMMON DIVISOR.

(149, page 77.)

Ex. 2. $2 \times 3 = 6$, Ans.

Ex. 5. $6 \times 7 = 42$, Ans.

Ex. 8. $3 \times 3 \times 7 = 63$, Ans.

Ex. 9. 91, Ans.

Ex. 11. $4 \times 3 \times 7 = 84$, Ans.

(150, page 81.)

Ex. 4. Ans. 11.

Ex. 5. Ans. 1.

Ex. 7. Ans. 17.

Ex. 8. Ans. 337

Ex. 10. In the operation under this rule, the quotient figure may always be so taken that the product shall be either greater, or less, than the dividend; in either case, the new divisor will be the *difference* between the dividend and product. It will always be found advantageous to use that quotient figure which will give the least number for a new divisor. In the first operation below, the second quotient figure is 1, and the next divisor is 413690; in the second operation, the second quotient figure is 2, which gives 178593 for the next divisor, and abbreviates the subsequent work

(76—81)

FIRST OPERATION.			SECOND OPERATION.		
1005973	4	4616175 4023892	1005973	4	4616175 4023892
592283	1	592283	1184566	2	592283
413690	1	413690	178593	3	535774
857186	2	178592	169512	3	56504
56504	5	169512	9081	6	54486
54486	6	9081	8072	4	2018
2018	4	8072	<i>Ans.</i> 1009	2	2018
2018	2	1009, <i>Ans.</i>			

Ex. 13. *Ans.* 47.

Ex. 15. In order that the bins may be equal, the number of bushels contained in one bin must be a *common divisor* of the two quantities. And in order that the number of bins may be the least possible, each must contain the *greatest common divisor* of the two quantities. *Ans.* 91 bushels.

Ex. 16. The pannels, to be of uniform length, must be a common measure or divisor of the three sides; and to be of the greatest possible length, they must be the greatest common divisor of the three sides. *Ans.* 11 feet.

Ex. 17. The price to be paid by each is the greatest common divisor of the three sums, \$620, \$1116, and \$1488, which is \$124. Hence, B can purchase $\$620 \div \$124 = 5$; C can purchase $\$1116 \div \$124 = 9$; and D can purchase $\$1488 \div \$124 = 12$.

Ex. 18. The greatest common divisor of 14599 feet and 10361 feet is 13 feet, the length of 1 joint in the fence $(14599 + 10361) \times 2 = 49920$ feet, the entire length of the

fence. $49920 \div 13 = 3840$, the number of joints in the fence; and $3840 \times 7 = 26880$, the number of rails, *Ans*

LEAST COMMON MULTIPLE.

(155, page 83.)

Ex. 1. $2 \times 2 \times 3 \times 11 \times 7 \times 5 = 4620$, *Ans*.

Ex. 2. $7 \times 3 \times 3 \times 2 \times 2 \times 11 \times 5 = 13860$, *Ans*

Ex. 3. $5 \times 3 \times 2 \times 2 \times 2 = 120$, *Ans*.

Ex. 4. $7 \times 5 \times 3 \times 2 \times 2 \times 2 \times 2 = 1680$, *Ans*

Ex. 5. $7 \times 5 \times 5 \times 3 = 525$, *Ans*.

Ex. 6. $19 \times 3 \times 7 \times 2 = 798$, *Ans*.

Ex. 7. $2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5 = 2880$, *Ans*

(156, page 85.)

Ex. 1.	5, 3, 2	15..18..21..24..35..36..42..50..60
	2 2, 3, 7, 5	3.. 7.. 4.. 7.. 6.. 7.. 5.. 2

$5 \times 3 \times 2 \times 2 \times 2 \times 3 \times 7 \times 5 = 12600$, *Ans*.

Ex. 2.	2, 2, 3	6..8..10..15..18..20..24
	2, 3, 5	2.. 5.. 5.. 3.. 5.. 2

$2 \times 2 \times 3 \times 2 \times 3 \times 5 = 360$, *Ans*.

Ex. 3	3, 5, 2	9..15..25..35..45..100
	3, 5, 7, 2	3.. 5.. 7.. 3.. 10

$3 \times 5 \times 2 \times 3 \times 5 \times 7 \times 2 = 6300$, *Ans*

Ex. 4.	3, 3, 2	18..27..36..40
	2, 2, 5, 3	3.. 2..20

$3 \times 3 \times 2 \times 2 \times 2 \times 5 \times 3 = 1080$, *Ans*

(83-85)

$$\begin{array}{r|l}
 \text{Ex. 5.} & 2, 3 \quad | \quad 12..26..52 \\
 & 2, 13 \quad | \quad 2..13..26 \\
 \hline
 & 2 \times 2 \times 3 \times 13 = 156, \text{ Ans.}
 \end{array}$$

$$\begin{array}{r|l}
 \text{Ex. 6.} & 2, 2, 17 \quad | \quad 32..34..36 \\
 & 8, 9 \quad | \quad 8.. \quad 9 \\
 \hline
 & 2 \times 2 \times 17 \times 8 \times 9 = 4896, \text{ Ans.}
 \end{array}$$

NOTE.—When numbers are prime to each other, as 5 and 9 in the above operation, their product will be their least common multiple

$$\begin{array}{r|l}
 \text{Ex. 7.} & 2, 2, 3 \quad | \quad 8..12..18..24..27..36 \\
 & 2, 3, 3 \quad | \quad 2.. \quad 3.. \quad 2.. \quad 9.. \quad 3 \\
 \hline
 & 2 \times 2 \times 2 \times 3 \times 3 \times 3 = 216, \text{ Ans.}
 \end{array}$$

$$\begin{array}{r|l}
 \text{Ex. 8.} & 2, 11 \quad | \quad 22..33..44..55..66 \\
 & 2, 3, 5 \quad | \quad 3.. \quad 2.. \quad 5.. \quad 3 \\
 \hline
 & 2 \times 11 \times 2 \times 3 \times 5 = 660, \text{ Ans.}
 \end{array}$$

NOTE.—The first three numbers in Ex. 7 and the first two in Ex. 8, above, are factors of remaining numbers in the examples respectively. They might, therefore, have been omitted in the operations.

$$\begin{array}{r|l}
 \text{Ex. 9.} & 2, 2, 3 \quad | \quad 64..84..96..216 \\
 & 2, 2, 2, 2 \quad | \quad 16.. \quad 7.. \quad 8.. \quad 18 \\
 & 8, 3, 7 \quad | \quad 7 \quad 9 \\
 \hline
 & 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 7 = 12096, \text{ Ans.}
 \end{array}$$

Ex. 10. The number of rods that will furnish *whole days work* to each one, must be some common multiple of 14 25, 8 and 20; and the *least* number of rods that will furnish

whole days' work to each of the men, must therefore be the least common multiple of 14, 25, 8 and 20.

Ans. 1400 rods.

Ex. 11. The least common multiple of the prices, \$4, \$21, \$49, and \$72, which is \$3528, *Ans.*

Ex. 12. When all the men work together, they will dig $\frac{1}{4} + \frac{1}{8} + \frac{1}{6} = \frac{3}{8}$ rods per day. The ditch must therefore be the least common multiple of 4 rods, 8 rods, 6 rods, and 18 rods, which is 72 rods, *Ans.*

Ex. 13. The least common multiple of 11 feet and 15 feet is $15 \times 11 = 165$ feet, the distance the carriage must move to bring the rivets up together. Hence, $165 \times 574 = 94710$ feet, the entire distance traveled; and $94710 \text{ feet} = 17 \text{ miles } 4950 \text{ feet}$, *Ans.*

CANCELLATION.

(159, page 87.)

$$\text{Ex. 2. } \frac{21 \times 8 \times 60^5 \times 7 \times 6^2}{7 \times 12 \times 3 \times 6 \times 3} = 80, \text{ Ans.}$$

$$\text{Ex. 3. } \frac{16 \times 5 \times 14^2 \times 40 \times 16 \times 60 \times 50}{40 \times 24 \times 50 \times 20 \times 7 \times 10} = 32, \text{ Ans.}$$

$$\text{Ex. 4. } \frac{61 \times 12 \times 5 \times 183 \times 18 \times 70}{3 \times 14 \times 9 \times 5 \times 20 \times 6} = 61, \text{ Ans.}$$

(86—88)

$$\begin{array}{r} \text{Ex. 5} \quad \begin{array}{r} 71 \qquad 11 \\ 213 \times 34 \times 190 \times 264 \\ \hline 30 \times 60 \times 30 \end{array} = 14839, \text{ Ans.} \end{array}$$

$$\begin{array}{r} \text{Ex. 6} \quad \begin{array}{r} 34 \times 31 \times 7 \times 15 \times 33 \times 13 \\ \hline 3 \times 60 \times 66 \times 4 \times 6 \end{array} = 403, \text{ Ans.} \end{array}$$

$$\begin{array}{r} \text{Ex. 7} \quad \begin{array}{r} 4 \mid 123 \\ 3 \\ \hline \end{array} \\ 9, \text{ Ans.} \end{array}$$

$$\begin{array}{r} \text{Ex. 8.} \quad \begin{array}{r} 13 \\ 50 \mid 100 \\ 15 \mid 7 \\ \hline \end{array} \\ 13, \text{ Ans.} \end{array}$$

$$\begin{array}{r} \text{Ex. 9} \quad \begin{array}{r} 30 \mid 16 \\ 3 \mid 602 \\ 8 \\ \hline \end{array} \\ 32 \text{ cents, Ans.} \end{array}$$

$$\begin{array}{r} \text{Ex. 10.} \quad 84 + 56 = 140 \text{ cents} \\ \begin{array}{r} 140 \mid 100 \\ 100 \\ \hline \end{array} \\ 240, \text{ Ans.} \end{array}$$

$$\begin{array}{l} \text{Ex. 11} \quad 75 \times 2 + 90 = 240 \text{ cents,} \\ \left. \begin{array}{l} \text{cost of 2 yards of the} \\ \text{first kind, and 1 yard} \\ \text{of the second.} \end{array} \right\} \end{array}$$

$$\begin{array}{r} \begin{array}{r} 11 \\ 340 \mid 100 \\ 20 \end{array} \\ 11 \times 2 = 22 \quad \begin{array}{l} 11 \text{ yards of the second kind;} \\ \text{" " " first " } \end{array} \left. \vphantom{\begin{array}{r} 11 \\ 340 \mid 100 \\ 20 \end{array}} \right\} \text{ Ans.} \end{array}$$

$$\begin{array}{r} \text{Ex. 12} \quad \begin{array}{r} 5 \\ 6 \times 30 \times 2 \times 44 \\ \hline 3 \times 20 \end{array} = 60 \text{ cents, Ans.} \end{array}$$

FRACTIONS.

NOTATION AND NUMERATION.

(169, page 90.)

Ex. 3. Ans. $\frac{19}{9}$.

Ex. 4. Ans. $\frac{34}{79}$.

Ex. 5. Ans. $\frac{488}{88}$.

Ex. 6. Ans. $\frac{1967}{327}$.

Ex. 7. Ans. $2\frac{500}{87}$.

Ex. 8. Ans. $100\frac{30}{82}$.

Ex. 9. Ans. $100\frac{101}{888888}$.

Ex. 10. Four *ninths*; seven *twelfths*; seventeen *thirty eighths*; forty-five *one hundredths*; seventy-two *three hundred seventy-fifths*; forty-eight *one thousand ninths*; eighty-four *seven thousand eight hundred sixty-thirds*; four hundred fifty-six *five hundred thirty-sevenths*.

Ex. 11. Twenty *fourths*; eighty-seven *thirtieths*; ninety-five *one hundredths*; forty-eight *twelfths*; seventy-five *four hundred thirty-sevenths*; one hundred seventy-five *halves*; four hundred thirty-six *fiftieths*; seven hundred sixty-six *four thousand eight hundred seventy-ninths*.

Ex. 12. Four hundred sixty-seven *nine hundred thirty-sixths*; five hundred thirty-six *two hundred forty-eighths*; ten thousand *seventy-fifths*; seventy-five *ten thousandths*; five thousand seven *three thousand sevenths*.

Ex. 13. One hundred fifty *five hundred thirty-sevenths*; four hundred thirty-six *nine hundred seventy seconds*; thirteen thousand seven hundred eighty-five *forty-seven thousand nine hundred fifty-sixths*; one hundred fifty thousand seven-hundred-two *four hundred seventy-five thousandths*; one hundred thousand one *two hundred thousand seconds*.

REDUCTION.

(177, page 92.)

Ex 6. $\frac{22}{33} = \frac{2}{3}$ Ans.

Ex. 7. $\frac{33}{44} = \frac{3}{4}$, Ans.

Ex. 8. $\frac{62}{173} = \frac{71}{193}$, Ans.

Ex. 9. $\frac{32}{64} = \frac{1}{2}$, Ans.

Ex 13 $\frac{44}{55} = \frac{4}{5}$, Ans.

Ex. 15. Ans. $\frac{12}{13}$, $\frac{23}{24}$.

(178, page 93.)

Ex 2 $4^2 = 14$, Ans.

Ex. 7. $24\frac{1}{2} = 28\frac{1}{2} = 28\frac{1}{2}$, Ans.

Ex. 9. $29^2 = 253\frac{7}{8}$, Ans.

Ex. 12. $\frac{10}{10} = 1\frac{1}{10}$, Ans.

(179, page 94.)

Ex. 2. $375 = 390$, Ans.

Ex. 3. $478 = 1447^2$, Ans.

Ex. 4. $36 = 2^4$, Ans.

(180, page 95.)

Ex. 3. $57\frac{1}{2} = 9^4$, Ans.

Ex. 5. $872\frac{1}{2} = 194^2$, Ans.

Ex. 8. $15\frac{1}{8} = \frac{1}{8}^7$, Ans.

Ex. 10. $43\frac{1}{2} = 17^4$, Ans.

Ex. 11. $760\frac{9}{10} = 7\frac{9}{10}^2$, Ans.

(181, page 96.)

Ex. i. $24 \div 3 = 8$;

Ex. 2. $96 \div 12 = 8$;

$\frac{2}{3} = \frac{1}{3}$, Ans.

$\frac{7}{12} = \frac{5}{8}$, Ans.

Ex. 3. $51 \div 17 = 3$;

Ex. 4. $78 \div 13 = 6$;

$\frac{1}{2} = \frac{3}{6}$, Ans.

$\frac{9}{12} = \frac{5}{8}$, Ans.

Ex. 5. $3000 \div 375 = 8$;

Ex. 6. $8 \div 4 = 2$;

$\frac{62}{175} = \frac{196}{3000}$, Ans.

$7\frac{1}{2} = \frac{1}{4} = \frac{1}{8}$, Ans.

Ex 7. $16\frac{7}{8} = 16\frac{1}{4} = \frac{6}{4}$;

$176 \div 4 = 44$; $\frac{6}{4} = \frac{386}{176}$, Ans.

Ex. 8 $363 \div 11 = 33$;

$5\frac{1}{11} = \frac{6}{11} = \frac{191}{363}$, Ans.

Ex. 9 $42 \div 7 = 6$; $36\frac{2}{7} = \frac{2}{7} = \frac{14}{42}$, Ans.

(92-96)

(182, page 96.)

Ex. 2. $\frac{2}{7}, \frac{5}{9} = \frac{10}{63}, \frac{35}{63}, \text{Ans.}$

Ex. 6. $\frac{1}{3}, \frac{1}{7}, \frac{1}{11} = \frac{77}{231}, \frac{33}{231}, \frac{21}{231}, \text{Ans.}$

(184, page 98.)

Ex. 1. $2 \times 2 \times 2 \times 5 = 40$, least common denominator;

$\frac{6}{8}, \frac{3}{10} = \frac{30}{40}, \frac{12}{40}, \text{Ans.}$

Ex. 2. $3 \times 2 \times 2 = 12$, least common denominator;

$\frac{3}{8}, \frac{1}{4}, \frac{5}{6} = \frac{9}{12}, \frac{3}{12}, \frac{10}{12}, \text{Ans.}$

Ex. 3. $5 \times 3 \times 2 \times 2 = 60$, least common denominator,

$\frac{3}{8}, \frac{7}{12}, \frac{11}{15} = \frac{45}{60}, \frac{35}{60}, \frac{44}{60}, \text{Ans.}$

Ex. 4. $2 \times 2 \times 2 \times 3 \times 3 = 72$, least common denominator.

$\frac{2}{3}, \frac{5}{6}, \frac{3}{8} = \frac{48}{72}, \frac{60}{72}, \frac{27}{72}, \text{Ans.}$

Ex. 5. $\frac{6}{14} = \frac{3}{7}; \frac{10}{24} = \frac{5}{12};$

$7, 2 \mid 7..12..42$

$2, 3 \mid \quad \quad 6.. 3$

$7 \times 2 \times 2 \times 3 = 84$, least common denominator.

$\frac{3}{7}, \frac{5}{12}, \frac{13}{14} = \frac{36}{84}, \frac{35}{84}, \frac{78}{84}, \text{Ans.}$

Ex. 6. $13 \times 3 \times 2 = 78$, least common denominator;

$\frac{2}{3}, \frac{4}{13}, \frac{35}{26}, \frac{4}{39} = \frac{52}{78}, \frac{24}{78}, \frac{75}{78}, \frac{8}{78}, \text{Ans.}$

Ex. 7. $5 \times 3 \times 2 \times 2 \times 2 = 120$, least common denominator;

$\frac{13}{15}, \frac{7}{18}, \frac{5}{24}, \frac{37}{60} = \frac{112}{120}, \frac{56}{120}, \frac{25}{120}, \frac{74}{120}, \text{Ans.}$

Ex. 8. $\frac{31}{24} = \frac{17}{8}; 7 \times 2 \times 2 \times 2 \times 3 = 168$, least com. denom.

$\frac{30}{21}, \frac{9}{28}, \frac{17}{12} = \frac{160}{168}, \frac{27}{168}, \frac{102}{168}, \text{Ans.}$

Ex. 9. $\frac{25}{40} = \frac{5}{8}; \frac{25}{120} = \frac{5}{24}; \frac{1}{64} = \frac{7}{512};$

$2, 2, 3 \mid 8..24..32$

$2, 2, 2 \mid \quad \quad 2.. 2.. 8$

$8 \times 2^5 = 96$, least common denominator;

$\frac{5}{8}, \frac{6}{24}, \frac{7}{32} = \frac{60}{96}, \frac{24}{96}, \frac{31}{96}, \text{Ans}$

(96—98)

- Ex. 10. $\frac{2}{14} = \frac{1}{7}$; $\frac{7}{119} = \frac{1}{17}$; $\frac{120}{442} = \frac{60}{221}$;
 $13 \times 17 = 221$, least common denominator;
 $\frac{2}{13}$, $\frac{1}{17}$, $\frac{60}{221} = \frac{34}{221}$, $\frac{143}{221}$, $\frac{60}{221}$, *Ans.*
- Ex. 11. $\frac{16}{525} = \frac{7}{23}$; $\frac{289}{385} = \frac{17}{23}$; $\frac{147}{1561} = \frac{3}{23}$;
 $53 \times 23 = 1219$, least common denominator;
 $\frac{7}{13}$, $\frac{17}{23}$, $\frac{3}{23} = \frac{371}{1219}$, $\frac{901}{1219}$, $\frac{713}{1219}$, *Ans.*
- Ex. 12. $7 \times 5 \times 2 = 70$, least common denominator;
 $\frac{1}{7}$, $\frac{3}{14}$, $\frac{1}{10} = \frac{190}{70}$, $\frac{1}{5}$, $\frac{119}{70}$, *Ans.*
- Ex. 13. $\frac{231}{1829} = \frac{13 \times 37}{1829}$; $\frac{3127}{8723} = \frac{53}{131}$; $\frac{5133}{5628} = \frac{59 \times 3}{5628} = \frac{177}{1688}$;
 $97 \times 59 \times 31 \times 2 = 354826$, least com. denom.;
 $\frac{231}{1829}$, $\frac{53}{131}$, $\frac{177}{1688} = \frac{180614}{354826}$, $\frac{183874}{354826}$, $\frac{323733}{354826}$, *Ans.*
- Ex. 14. $2^3 \times 3^3 \times 5 \times 7 = 7560$, least com. denom.;
 $\frac{5}{7}$, $\frac{11}{12}$, $\frac{2}{15}$, $\frac{8}{27}$, $\frac{9}{35}$, $\frac{1}{10} =$
 $\frac{5480}{7560}$, $\frac{6880}{7560}$, $\frac{1008}{7560}$, $\frac{2240}{7560}$, $\frac{1844}{7560}$, $\frac{3212}{7560}$, *Ans.*
- Ex. 15. $13 \times 7 \times 2 \times 2 = 364$, least com. denom.;
 $\frac{4}{13}$, $\frac{3}{28}$, $\frac{5}{52}$, $\frac{7}{182} = \frac{208}{364}$, $\frac{84}{364}$, $\frac{36}{364}$, $\frac{49}{364}$, $\frac{30}{364}$, *Ans.*
- Ex. 16. $\frac{5}{78} = \frac{1}{15}$; $\frac{32}{88} = \frac{4}{11}$;
 $5 \times 3 \times 7 = 105$, least com. denom.;
 $\frac{4}{15}$, $\frac{1}{15}$, $\frac{4}{11} = \frac{28}{165}$, $\frac{7}{165}$, $\frac{60}{165}$, $\frac{155}{165}$, *Ans.*

ADDITION.

(186, page 100.)

- Ex. 1. $\frac{7+4}{12} + \frac{5+1}{12} = \frac{27}{12} = 2\frac{3}{4} = 2\frac{1}{2}$, *Ans.*
- Ex. 2. $\frac{13+4}{15} + \frac{2+8}{15} = \frac{27}{15} = 1\frac{1}{5}$, *Ans.*
- Ex. 3. $\frac{5+8}{21} + \frac{16+19}{21} = \frac{48}{21} = 2\frac{2}{7}$, *Ans.*
- Ex. 4. $7+8+2+5+4 = 26$
 $\frac{14}{14} + \frac{22}{14} + \frac{17}{14} + \frac{18}{14} + \frac{22}{14} = 2\frac{1}{2}$
 $28\frac{1}{2}$, *Ans.*

Ex. 5. $37+12+13 = 62$

$$\frac{2}{58} + \frac{27}{58} + \frac{37}{58} + \frac{53}{58} = \frac{21}{1}$$

$64\frac{1}{2}$, Ans.

Ex. 6. $\frac{3}{4} + \frac{3}{4} + \frac{5}{8} = \frac{8+9+10}{12} = \frac{27}{12} = 2\frac{1}{4}$, Ans.

Ex. 7. $\frac{3}{8} + \frac{4}{7} + \frac{13}{15} + \frac{7}{15} = \frac{63+60+65+42}{105} = \frac{230}{105} = 2\frac{2}{21}$, Ans.

Ex. 8. $\frac{1}{4} + \frac{2}{9} + \frac{1}{18} = \frac{15+10+3}{45} = \frac{28}{45}$, Ans.

Ex. 9. $\frac{5}{12} + \frac{13}{15} + \frac{7}{20} = \frac{25+52+21}{60} = \frac{98}{60} = 1\frac{49}{30}$, Ans.

Ex. 10. $\frac{1}{3} + \frac{3}{4} + \frac{11}{12} + \frac{29}{24} = \frac{28+63+77+58}{84} = \frac{226}{84} = 2\frac{29}{21}$, Ans.

Ex. 11. $\frac{7}{8} + \frac{11}{12} + \frac{17}{18} + \frac{23}{24} + \frac{29}{24} =$

$$\frac{189+198+204+207+208}{216} = \frac{1006}{216} = 4\frac{71}{108}$$
, Ans

Ex. 12. $3+4+2 = 9$

$$\frac{1}{2} + \frac{2}{3} + \frac{2}{15} = 1\frac{3}{10}$$

$10\frac{3}{10}$, Ans

Ex. 13. $16+24=40$

$$\frac{1}{12} + \frac{1}{18} = \frac{5}{36}$$

$40\frac{5}{36}$, Ans.

Ex. 14. $1+2+3+4+5=15$

$$\frac{1}{2} + \frac{1}{4} + \frac{3}{4} + \frac{1}{8} + \frac{5}{8} = 3\frac{11}{8}$$

$18\frac{11}{8}$, Ans

Ex. 15. $4+8+2 = 14$

$$\frac{7}{8} + \frac{5}{21} + \frac{8}{35} = 1\frac{4}{35}$$

$14\frac{4}{35}$, Ans.

Ex. 16. $\frac{1}{3} + \frac{1}{4} + \frac{1}{12} + \frac{1}{17} = \frac{68+51+17+12}{204} = \frac{37}{51}$, Ans

Ex. 17. $\frac{1}{2} + \frac{2}{3} + \frac{3}{13} + \frac{5}{17} = \frac{663+884+204+320}{1326} = 1\frac{815}{663}$, Ans

Ex. 18. $\frac{1}{2} + \frac{3}{8} + \frac{3}{11} + \frac{7}{18} + \frac{17}{33} =$

$$\frac{99+44+54+77+102}{198} = 1\frac{86}{99}$$
, Ans

Ex. 19. $\frac{1}{4} + \frac{5}{14} + \frac{3}{15} + \frac{2}{3} =$

$$\frac{329+285+336+532}{798} = \frac{1562}{798} = 1\frac{377}{399}$$
, Ans

Ex. 20. $41+105+300+241+472=1159$

$$\frac{1}{2} + \frac{2}{3} + \frac{3}{4} + \frac{4}{5} + \frac{1}{4} = \frac{233}{60}$$

$$1161\frac{23}{60}, \text{ Ans}$$

Ex. 21. $4+2+1+2+5+7+4+6=31$

$$\frac{1}{8} + \frac{1}{4} + \frac{1}{8} + \frac{5}{24} + \frac{7}{8} + \frac{2}{3} + \frac{1}{2} + \frac{6}{8} = \frac{31}{12}$$

$$34\frac{1}{12}, \text{ Ans}$$

Ex. 22. $36+42+39+51=168$

$$\frac{5}{8} + \frac{2}{3} + \frac{7}{8} + \frac{1}{4} = \frac{147}{8}$$

$$169\frac{47}{8} \text{ pounds, Ans}$$

Ex. 23. $4+3=7$

$$\frac{1}{8} + \frac{2}{3} = \frac{13}{24}$$

$$8\frac{2}{3}, \text{ Ans.}$$

Ex. 24. $\frac{6}{18} + \frac{6}{54} = \frac{16}{27} = \frac{16}{27}, \text{ Ans.}$

Ex. 25. $\frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{2}{15} = \frac{76}{120} = \frac{19}{30}$ of a dollar, Ans

Ex. 26. $46+64+76=186$

$$\frac{4}{9} + \frac{1}{2} + \frac{1}{6} = \frac{13}{18}$$

$$187\frac{13}{18} \text{ yards;}$$

$$\$127 + \$226 + \$312 = \$665$$

$$\$ \frac{7}{8} + \$ \frac{5}{8} + \$ \frac{2}{3} = 1\frac{1}{6}$$

$$\$666\frac{1}{6}, \text{ received for the whole}$$

SUBTRACTION.

(188, page 102.)

Ex. 1. $\frac{7}{15} - \frac{3}{15} = \frac{4}{15}, \text{ Ans.}$

Ex. 2. $\frac{35}{56} - \frac{21}{56} = \frac{14}{56} = \frac{1}{4}, \text{ Ans}$

Ex. 3. $\frac{23}{57} - \frac{2}{57} = \frac{21}{57} = \frac{7}{19}, \text{ Ans.}$

(100--102)

$$\text{Ex 4. } \frac{6}{8} - \frac{3}{8} = \frac{29-2}{24} = \frac{1}{4}, \text{ Ans.}$$

$$\text{Ex 5. } \frac{3}{4} - \frac{7}{6} = \frac{15-7}{20} = \frac{8}{20} = \frac{2}{5}, \text{ Ans.}$$

$$\text{Ex. 6. } \frac{13}{16} - \frac{7}{24} = \frac{104-35}{120} = \frac{69}{120} = \frac{23}{40}, \text{ Ans.}$$

$$\text{Ex. 7. } \frac{9}{14} - \frac{13}{63} = \frac{81-32}{126} = \frac{49}{126} = \frac{7}{18}, \text{ Ans.}$$

$$\text{Ex. 8. } \frac{13}{39} - \frac{12}{85} = \frac{70-37}{195} = \frac{18}{195} = \frac{6}{65}, \text{ Ans.}$$

$$\text{Ex 9. } \frac{5}{21} - \frac{1}{15} = \frac{25-7}{105} = \frac{18}{105} = \frac{6}{35}, \text{ Ans.}$$

$$\text{Ex 10. } \frac{7}{12} - \frac{5}{42} = \frac{49-10}{84} = \frac{39}{84} = \frac{13}{28}, \text{ Ans.}$$

$$\text{Ex. 11. } \frac{7}{84} - \frac{13}{120} = \frac{105-98}{960} = \frac{7}{960}, \text{ Ans.}$$

$$\text{Ex 12. } \frac{9}{35} - \frac{7}{30} = \frac{54-49}{210} = \frac{5}{210} = \frac{1}{42}, \text{ Ans.}$$

$$\text{Ex. 13. } 16\frac{5}{8}$$

$$\underline{7\frac{1}{8}}$$

$$9\frac{4}{8} = 9\frac{1}{2}, \text{ Ans.}$$

$$\text{Ex. 14. } 36\frac{1}{4}$$

$$\underline{8\frac{1}{4}}$$

$$27\frac{3}{4} = 27\frac{3}{4}, \text{ Ans.}$$

$$\text{Ex 15. } 25\frac{7}{10} = 25\frac{7}{10}$$

$$\underline{14\frac{1}{10}}$$

$$10\frac{6}{10} = 10\frac{3}{5}, \text{ Ans.}$$

$$\text{Ex. 16. } 75$$

$$\underline{44}$$

$$70\frac{1}{4}, \text{ Ans.}$$

$$\text{Ex. 17. } 18\frac{3}{8} = 18\frac{4}{8}$$

$$\underline{5\frac{2}{8}}$$

$$12\frac{7}{8}, \text{ Ans.}$$

$$\text{Ex 18. } 26\frac{7}{8} = 26\frac{35}{40}$$

$$\underline{25\frac{1}{4}}$$

$$1\frac{1}{2} = 1\frac{1}{2}, \text{ Ans.}$$

$$\text{Ex 19 } 28\frac{1}{3} = 28\frac{32}{96}$$

$$\underline{3\frac{9}{14} = 3\frac{81}{128}}$$

$$24\frac{77}{128} = 24\frac{1}{8}, \text{ Ans.}$$

$$\text{Ex 20 } 78\frac{7}{15} = 78\frac{7}{15}$$

$$\underline{32\frac{2}{3}}$$

$$45\frac{1}{3} = 45\frac{1}{3}, \text{ Ans.}$$

$$\text{Ex 21 } 36\frac{1}{4} - 7\frac{1}{3} = 19\frac{2}{3}, \text{ Ans.}$$

$$\text{Ex 22 } 97\frac{8}{9} - 18\frac{1}{4} = 79\frac{29}{36}, \text{ Ans.}$$

$$\text{Ex 23 } 126\frac{1}{4} + 240\frac{3}{4} = 366\frac{2}{2};$$

$$560\frac{5}{8} - 366\frac{2}{8} = 193\frac{3}{8}, \text{ Ans.}$$

Ex. 24. $\frac{1}{8} + \frac{1}{12} + \frac{1}{16} = \frac{11}{24}$; $\frac{2}{3} - \frac{1}{2} = \frac{1}{6}$, *Ans.*

Ex. 25. $\frac{5}{6} - \frac{2}{3} = \frac{1}{6}$, *Ans.*

Ex. 26. $31\frac{1}{2} - 14\frac{1}{4} = 16\frac{1}{4}$ gallons, *Ans.*

Ex. 27. \$140 $\frac{3}{4}$	\$ 775 $\frac{1}{2}$
456 $\frac{3}{4}$	516 $\frac{3}{8}$

\$597 $\frac{1}{4}$, bought for; \$1291 $\frac{2}{3}$, sold for;

$\$1291\frac{2}{3} - \$597\frac{1}{4} = \$694\frac{1}{4}$, *Ans.*

MULTIPLICATION.

(193, page 105.)

Ex. 1. $\frac{3}{4} \times \frac{8}{9} = \frac{2}{3}$, *Ans.*

Ex. 2. $\frac{4}{5} \times 2\frac{7}{10} = 12$; $\frac{3}{4} \times \frac{4}{5} = \frac{3}{5}$; $\frac{5}{8} \times \frac{8}{9} = \frac{5}{9} = 1\frac{1}{9}$.

Ex. 3. $\frac{7}{8} \times \frac{1}{5} = \frac{7}{40}$, *Ans.* Ex. 4. $\frac{8}{9} \times \frac{3}{4} = 6$, *Ans.*

Ex. 5. $\frac{7}{8} \times \frac{3}{5} = 15$; $\frac{7}{8} \times \frac{8}{21} = \frac{2}{3} = 2\frac{2}{3}$; $2\frac{1}{2} \times \frac{8}{3} = 630$; $4\frac{1}{2} \times \frac{6}{24} = 119\frac{1}{2}$.

Ex. 6. $\frac{3}{4} \times \frac{5}{8} = \frac{15}{32}$, *Ans.*

Ex. 7. $\frac{1}{3} \times \frac{2}{3} = \frac{2}{9}$; $\frac{1}{4} \times \frac{5}{7} = \frac{5}{28}$.

Ex. 8. $\frac{7}{12} \times \frac{1}{2} = \frac{7}{24}$; $\frac{8}{9} \times \frac{2}{3} = \frac{16}{27}$.

Ex. 9. $\frac{1}{2} \times \frac{3}{5} = 10$, *Ans.* Ex. 10. $\frac{3}{4} \times \frac{8}{5} = \frac{6}{5} = 2\frac{1}{5}$, *Ans.*

Ex. 11. $\frac{9}{14} \times \frac{8}{3} = \frac{6}{7} = 1\frac{1}{7}$, *Ans.*

Ex. 12. $\frac{2}{3} \times \frac{5}{8} \times \frac{9}{15} \times \frac{7}{6} = \frac{7}{4}$, *Ans.*

Ex. 13. $\frac{2}{3} \times \frac{7}{8} \times \frac{5}{8} \times \frac{4}{11} \times \frac{4}{7} = \frac{1}{15}$, *Ans.*

Ex. 14. $\frac{3}{4} \times \frac{7}{5} \times \frac{1}{10} = \frac{21}{200}$, *Ans.*

Ex. 15. $\frac{1}{2} \times \frac{1}{3} \times \frac{2}{11} \times \frac{5}{10} \times \frac{3}{4} \times \frac{1}{5} = 2$, *Ans.*

Ex. 16. $\frac{7}{11} \times \frac{5}{21} \times \frac{2}{3} \times \frac{1}{5} \times \frac{3}{8} = \frac{1}{154}$, *Ans.*

Ex. 17. $\frac{4}{12} \times \frac{5}{8} \times \frac{7}{10} \times \frac{5}{3} = \frac{7}{12}$, *Ans.*

Ex. 18. $4\frac{1}{2} \times \frac{7}{8} = 3\frac{7}{8}$; $3\frac{1}{8} \times 1\frac{3}{4} = 5\frac{1}{2}$; $3\frac{1}{2} - 1\frac{1}{2} = 2$;
 $5\frac{1}{2} \times 2\frac{3}{4} = 13\frac{3}{8}$, *Ans.*

- Ex. 19 $7\frac{1}{2} - 2\frac{2}{5} = 5\frac{7}{10}$; $\frac{4}{5} + \frac{1}{3} = 1\frac{2}{15}$;
 $5\frac{7}{10} \times \frac{2}{3} \times 1\frac{2}{15} = 5\frac{19}{30}$; $5\frac{19}{30} + 28 = 33\frac{19}{30}$. *Ans.*
- Ex. 20. $\frac{1}{4} \times \frac{4}{5} \times \frac{5}{6} = \frac{2}{6}$, *Ans.* Ex. 21. $\frac{2}{3} \times \frac{7}{8} \times 2\frac{1}{2} = 1\frac{1}{2}$, *Ans.*
- Ex. 22. $\frac{6}{8} \times \frac{4}{15} \times \frac{6}{7} = \frac{1}{7}$, *Ans.*
- Ex. 23. $\frac{1}{2} \times \frac{5}{3} \times \frac{18}{5} \times \frac{2}{3} = \frac{3}{2}$, *Ans.*
- Ex. 24. $\frac{1}{2} \times \frac{2}{3} \times \frac{3}{4} \times \frac{4}{5} \times \frac{5}{6} \times \frac{6}{7} \times \frac{7}{8} \times \frac{8}{9} \times \frac{9}{10} = \frac{1}{10}$, *Ans.*
- Ex. 25 $\frac{9}{11} = \frac{3 \times 3}{11}$; $\frac{12}{13} = \frac{3 \times 4}{13}$; $\frac{12}{13} \times \frac{9}{11} = \frac{3 \times 3 \times 4}{13 \times 11}$; $\frac{24}{13} = \frac{2 \times 12}{13}$; $\frac{24}{13} \times \frac{9}{11} = \frac{2 \times 3 \times 4 \times 3}{13 \times 11}$;
 $\frac{3 \times 3 \times 4 \times 3}{13 \times 11} \times \frac{5 \times 3 \times 2 \times 3}{7 \times 9 \times 11} \times \frac{7 \times 9 \times 3 \times 1}{10 \times 1 \times 5 \times 3} = \frac{5 \times 3 \times 2 \times 3}{10 \times 1}$, *Ans.*
- Ex. 26. $\frac{6}{9} \times \frac{4}{13} \times \frac{6}{7} \times \frac{4}{3} \times \frac{6}{3} \times \frac{5}{6} \times \frac{6}{7} = \frac{6}{7}$, *Ans.*
- Ex. 27. $\frac{4}{7} \times \frac{15}{10} \times \frac{9}{7} \times \frac{9}{7} \times \frac{9}{7} \times \frac{8}{3} \times \frac{10}{10} = \frac{120}{7}$, *Ans.*
- Ex. 28. $\$3\frac{3}{8} \times 7 = \$25\frac{3}{8}$, *Ans.*
- Ex. 29. $\frac{3}{4} \times \frac{3}{4} \times \frac{3}{2} \times \frac{1}{5} \times \frac{1}{5} \times \frac{1}{5} \times \frac{1}{5} \times \frac{1}{5} = \frac{3}{21875}$, *Ans.*
- Ex. 30. $\frac{3}{4} \times 10 \times 6 = 25\frac{3}{4}$, *Ans.*
- Ex. 31. $\frac{10}{2} \times \frac{10}{2} \times \frac{10}{2} \times \frac{10}{2} \times \frac{10}{2} \times \frac{10}{2} \times \frac{10}{2} \times \frac{10}{2} \times \frac{10}{2} \times \frac{10}{2} = 21341\frac{1}{2}$, *Ans.*
- Ex. 32. $\$9\frac{3}{4} \times \frac{1}{2} \times \frac{5}{8} = \$1$, *Ans.*
- Ex. 33. $\$ \frac{9}{16} \times 1\frac{3}{4} = \$ \frac{9}{10}$, *Ans.* Ex. 34. $\$7 \times \frac{1}{4} = \$ \frac{7}{4}$, *Ans.*
- Ex. 35. $156\frac{2}{3} \times \frac{4}{5} \times \frac{1}{2} \times \frac{3}{4} = 47$, *Ans.*
- Ex. 36. $\frac{2}{8} \times \frac{2}{8} \times \frac{2}{8} \times \frac{1}{2} \times \frac{1}{2} \times \frac{9}{10} \times \frac{9}{10} \times \frac{10}{3} \times \frac{10}{3} \times \frac{10}{3} \times \frac{10}{3}$.
 $= \frac{375}{12}$, *Ans.*

Ex. 37. $1\frac{1}{3} \times 6 \times 8\frac{2}{10} = 94\frac{1}{3}$, *Ans.*

Ex. 38. $\frac{4}{5} \times 121\frac{1}{5} = 104\frac{2}{5}$; $\frac{3}{4} \times 48\frac{3}{4} = 36\frac{1}{2}$;
 $104\frac{2}{5} + 36\frac{1}{2} - 75 = 65\frac{9}{10}$;
 $150\frac{1}{2} - 65\frac{9}{10} = 84\frac{3}{10}$, multiplicand;
 $\frac{4}{5} \times 1\frac{1}{8} \times 4 = 3\frac{1}{2}$; $3\frac{3}{4} - 2\frac{1}{4} = 1\frac{1}{2}$;
 $1\frac{7}{10} \times 3 = 4\frac{1}{10}$, multiplier;
 $84\frac{3}{10} \times 4\frac{1}{10} = 342\frac{63}{100}$, *Ans.*

Ex. 39. $\frac{1}{2} \times \frac{5}{8} \times \frac{5}{7} = \frac{25}{56}$, *Ans.*

Ex. 40. $\frac{5}{8} - (\frac{3}{4} \times \frac{5}{8}) = \frac{5}{24}$, A's share;
 $\frac{3}{4} \times \frac{5}{8} - (\frac{1}{2} \times \frac{3}{4} \times \frac{5}{8}) = \frac{5}{16}$, B's share;
 $\frac{1}{2} \times \frac{3}{4} \times \frac{5}{8} - (\frac{2}{3} \times \frac{1}{2} \times \frac{3}{4} \times \frac{5}{8}) = \frac{5}{48}$, C's share;
 $\frac{2}{3} \times \frac{1}{2} \times \frac{3}{4} \times \frac{5}{8} = \frac{5}{24}$, D's share.

(106, 107)

$$\text{Ex. 41. } 2\frac{1}{4} \times \frac{1}{2} = 1\frac{1}{8}; \frac{5}{8} \times 4\frac{1}{4} \times (\frac{2}{3})^2 = 1\frac{5}{6}; (3\frac{1}{2})^2 - (3\frac{1}{2})^2 = 35\frac{1}{2}; \frac{1}{2} + \frac{1}{3} + 35\frac{1}{2} = 36\frac{1}{6}, \text{ Ans}$$

DIVISION.

(195, page 108.)

$$\text{Ex 2 } \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}; \frac{1}{3} \times \frac{1}{5} = \frac{1}{15}.$$

$$\text{Ex 3. } \frac{1}{2} \div \frac{1}{2} = 35, \text{ Ans.}$$

$$\text{Ex. 4. } \frac{1}{2} \times \frac{1}{2} = 1\frac{1}{2} = 37\frac{1}{2}; \frac{1}{2} \times \frac{1}{2} = \frac{1}{2} = 7\frac{1}{2}.$$

$$\text{Ex 5. } \frac{1}{2} \times \frac{1}{2} = 36, \text{ Ans.} \quad \text{Ex. 6. } \frac{1}{2} \times \frac{1}{2} = \frac{1}{2}, \text{ Ans}$$

$$\text{Ex 7. } \frac{1}{2} \times \frac{1}{2} = \frac{1}{2}; \frac{1}{2} \times \frac{1}{2} = 1\frac{1}{2}; \frac{1}{2} \times \frac{1}{2} = \frac{1}{2}.$$

$$\text{Ex. 8. } \frac{1}{2} \times \frac{1}{2} = \frac{1}{2} = 1\frac{1}{2}, \text{ Ans.}$$

$$\text{Ex 9. } \frac{1}{2} \times \frac{1}{2} = \frac{1}{2} = 1\frac{1}{2}, \text{ Ans.}$$

$$\text{Ex. 11. } \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = 1, \text{ Ans.}$$

$$\text{Ex 12 } \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = 1\frac{1}{2} = 1\frac{1}{2}, \text{ Ans}$$

$$\text{Ex 13. } \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = 1\frac{1}{2} = 1\frac{1}{2}, \text{ Ans}$$

$$\text{Ex 14. } \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{2}, \text{ Ans.}$$

$$\text{Ex 15. } \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = 25, \text{ Ans.}$$

$$\text{Ex. 16. } \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = 3\frac{3}{4}, \text{ Ans.}$$

$$\text{Ex. 17. } \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = 1\frac{1}{2}, \text{ Ans}$$

$$\text{Ex. 18. } \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{2}, \text{ Ans.}$$

$$\text{Ex. 19 } \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{2}, \text{ Ans}$$

$$\text{Ex. 22. } \frac{\frac{1}{2} \times \frac{1}{2}}{\frac{1}{2} \times \frac{1}{2}} = \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = 2, \text{ Ans.}$$

$$\text{Ex. 23. } 7 + 3\frac{1}{2} = 10\frac{1}{2}; \frac{10\frac{1}{2}}{1\frac{1}{2}} = \frac{10\frac{1}{2}}{1\frac{1}{2}} \times \frac{1}{2} = \frac{1}{2} = 7\frac{1}{2}, \text{ Ans}$$

$$\text{Ex. 24. } \frac{1}{2} \div \frac{1}{2} = \frac{1}{2}; \frac{1}{2} \div \frac{1}{2} = \frac{1}{2}; \frac{\frac{1}{2}}{\frac{1}{2}} = \frac{1}{2} \times \frac{2}{1} = \frac{1}{2}, \text{ Ans}$$

$$\text{Ex. 25. } \frac{4}{7} - \frac{2}{3} = \frac{1}{21} \quad \frac{\frac{21}{1} \times \frac{1}{21}}{\frac{1}{3} \times \frac{2}{7}} = \frac{1}{21} \times \frac{3}{1} \times \frac{7}{2} = \frac{1}{2}, \text{ Ans}$$

$$\text{Ex. 26. } 6\frac{1}{5} - 5\frac{4}{15} = 1\frac{1}{3}; \quad \frac{\frac{6}{5} \times \frac{3}{1}}{\frac{1}{15}} = \frac{6}{5} \times \frac{3}{1} \times \frac{15}{1} = 54, \text{ Ans}$$

$$\text{Ex. 27. } 8\frac{1}{5} \div 7 = 8\frac{1}{5} \times \frac{1}{7} = \frac{1}{35}, \text{ Ans.}$$

$$\text{Ex. 28. } \$6\frac{1}{2} \div \$\frac{2}{3} = \frac{13}{2} \times \frac{3}{2} = \frac{39}{2} = 17\frac{1}{2}, \text{ Ans.}$$

$$\text{Ex. 29. } \$30 \div \frac{1}{9} = \$30 \times \frac{9}{1} = \$270, \text{ Ans.}$$

$$\text{Ex. 30. } 8\frac{2}{10} \div (\frac{1}{2} \times \frac{3}{4}) = \frac{82}{10} \times \frac{2}{1} \times \frac{4}{3} = \frac{164}{3} = 54\frac{2}{3} \text{ pinte, Ans.}$$

$$\text{Ex. 31. } 8\frac{2}{8} \div \frac{3}{10} = 8\frac{1}{4} \times \frac{10}{3} = 8\frac{5}{3} = 27\frac{2}{3}, \text{ Ans.}$$

$$\text{Ex. 32. } \$\frac{30}{1} \times \frac{1}{3} \times \frac{2}{5} \times \frac{3}{7} \times \frac{3}{13} = \$\frac{60}{13} = \$4\frac{8}{13}, \text{ Ans.}$$

$$\text{Ex. 33. } (\$1725\frac{3}{4} \div 235\frac{1}{2}) \times 125\frac{1}{2} =$$

$$\$1280\frac{3}{4} \times \frac{2}{1} \times \frac{1}{2} = \$1280, \text{ Ans.}$$

$$\text{Ex. 34. } 26\frac{1}{4} \div \frac{5}{8} = 26\frac{1}{4} \times \frac{8}{5} = \frac{62}{5} = 12\frac{2}{5}, \text{ Ans.}$$

$$\text{Ex. 35. } 27 \div 2\frac{2}{3} = 27 \times \frac{3}{8} = \frac{81}{8} = 10\frac{1}{8}, \text{ Ans.}$$

$$\text{Ex. 36. } 148\frac{3}{4} \div 16\frac{1}{2} = \frac{595}{4} \times \frac{2}{33} = \frac{595}{66} = 8\frac{5}{6}, \text{ Ans}$$

$$\text{Ex. 37. } \frac{7}{9} \times \frac{8}{5} \times \frac{6}{7} \times \frac{1}{2} = \frac{8}{5} = 1\frac{3}{5}, \text{ Ans.}$$

$$\text{Ex. 38. } 28 - 7\frac{1}{2} = 20\frac{1}{2}; \quad 20\frac{1}{2} \times \frac{8}{5} = 82\frac{1}{5}; \quad 720 - 82\frac{1}{5} =$$

$$637\frac{4}{5}; \quad \frac{637\frac{4}{5}}{10} = 63\frac{7}{10}; \quad 40\frac{1}{4} + 1\frac{1}{2} = 41\frac{3}{4}; \quad 41\frac{3}{4} \times$$

$$(\frac{1}{2})^4 = 2\frac{3}{8}; \quad 707\frac{3}{8} \div 2\frac{3}{8} = 11\frac{1}{2} \times \frac{6}{7} = 9\frac{3}{7} = 9\frac{6}{7}, \text{ Ans.}$$

$$\text{Ex. 39. } 3\frac{1}{2} \times (\frac{2}{3})^2 = \frac{14}{9}; \quad \frac{2}{3} \times \frac{1}{3} = \frac{2}{9}; \quad \frac{1}{8} + \frac{1}{4} = \frac{3}{8};$$

$$\frac{2}{3} \div (\frac{2}{3})^3 \times 5 = 4\frac{2}{3}; \quad 17\frac{1}{8} - \frac{3}{8} + 4\frac{2}{8} = 21\frac{2}{8} = 21\frac{1}{4};$$

$$\frac{100}{100} \times \frac{81}{100} \times \frac{81}{100} \times \frac{280}{5977} = \frac{17720081}{1000000}, \text{ Ans.}$$

$$\text{Ex. 40. } \frac{1}{2} \times \frac{8}{125} \times \frac{1}{4} \times \frac{2}{3} \times \frac{4}{7} \times \frac{4}{17} \times \frac{8}{16} \times \frac{8}{11} \times \frac{1}{9} \times \frac{1}{17}$$

$$= \frac{1}{111111111}, \text{ Ans}$$

REDUCTION.

(177, page 92.)

Ex 6. $\frac{888}{888} = 1\frac{1}{1}$ Ans.

Ex. 7. $\frac{333}{333} = 1\frac{1}{1}$, Ans.

Ex. 8. $\frac{639}{1737} = \frac{71}{193}$, Ans.

Ex. 9. $\frac{522}{7042} = \frac{27}{302}$, Ans.

Ex 13 $\frac{4489}{1181} = \frac{37}{3}$, Ans.

Ex. 15. Ans. $\frac{1002}{2223}$, $\frac{2223}{2223}$.

(178, page 93.)

Ex 2 $\frac{6}{4} = 1\frac{1}{2}$, Ans.

Ex. 7. $\frac{2431}{888} = 2\frac{85}{888} = 2\frac{1}{8}$, Ans

Ex. 9. $\frac{3902}{15} = 253\frac{7}{15}$, Ans.

Ex. 12. $\frac{10302}{10301} = 1\frac{10}{10301} = 1\frac{1}{10301}$, Ans.

(179, page 94.)

Ex. 2. $375 = 300$, Ans.

Ex. 3. $478 = 1\frac{1}{2}472$, Ans

Ex. 4. $36 = 3\frac{2}{3}$, Ans.

(180, page 95.)

Ex. 3. $57\frac{1}{2} = 49\frac{1}{2}$, Ans.

Ex. 5. $872\frac{1}{12} = 104\frac{6}{12}$, Ans

Ex. 8. $15\frac{7}{8} = 1\frac{7}{8}$, Ans.

Ex. 10. $43\frac{3}{4} = 1\frac{3}{4}$, Ans.

Ex. 11. $760\frac{9}{10} = 7\frac{69}{10}$, Ans.

(181, page 96.)

Ex. i. $24 \div 3 = 8$;

Ex. 2. $96 \div 12 = 8$;

$\frac{2}{3} = \frac{1}{1\frac{1}{2}}$, Ans.

$\frac{7}{12} = \frac{5}{18}$, Ans.

Ex. 3. $51 \div 17 = 3$;

Ex. 4. $78 \div 13 = 6$;

$1\frac{3}{4} = \frac{3}{1}$, Ans.

$\frac{9}{13} = \frac{5}{13}$, Ans.

Ex. 5. $3000 \div 375 = 8$;

Ex. 6. $8 \div 4 = 2$;

$\frac{62}{375} = \frac{496}{3000}$, Ans.

$7\frac{3}{4} = 3\frac{1}{2} = \frac{7}{2}$, Ans

Ex 7. $16\frac{7}{8} = 16\frac{1}{4} = \frac{65}{4}$;

$176 \div 4 = 44$; $\frac{65}{4} = 2\frac{860}{176}$, Ans.

Ex. 8 $363 \div 11 = 33$;

$5\frac{3}{11} = \frac{58}{11} = \frac{1914}{363}$, Ans.

Ex. 9 $42 \div 7 = 6$; $36\frac{5}{7} = 2\frac{5}{7} = 1\frac{542}{42}$, Ans

(92-96)

(182, page 96.)

Ex. 2. $\frac{2}{7}, \frac{5}{9} = \frac{10}{63}, \frac{14}{63}, \text{Ans.}$

Ex. 6. $\frac{1}{2}, \frac{1}{7}, \frac{1}{11} = \frac{11}{231}, \frac{33}{231}, \frac{21}{231}, \text{Ans.}$

(184, page 98.)

Ex. 1. $2 \times 2 \times 2 \times 5 = 40$, least common denominator;
 $\frac{6}{8}, \frac{3}{10} = \frac{30}{40}, \frac{12}{40}, \text{Ans.}$

Ex. 2. $3 \times 2 \times 2 = 12$, least common denominator;
 $\frac{2}{3}, \frac{1}{4}, \frac{5}{6} = \frac{8}{12}, \frac{3}{12}, \frac{10}{12}, \text{Ans.}$

Ex. 3. $5 \times 3 \times 2 \times 2 = 60$, least common denominator,
 $\frac{1}{5}, \frac{7}{12}, \frac{1}{15} = \frac{12}{60}, \frac{35}{60}, \frac{4}{60}, \text{Ans.}$

Ex. 4. $2 \times 2 \times 2 \times 3 \times 3 = 72$, least common denominator,
 $\frac{2}{3}, \frac{5}{9}, \frac{3}{8} = \frac{48}{72}, \frac{40}{72}, \frac{27}{72}, \text{Ans.}$

Ex. 5. $\frac{6}{14} = \frac{3}{7}; \frac{10}{14} = \frac{5}{7};$

$$\begin{array}{r|l} 7, 2 & 7..12..42 \\ 2, 3 & \hline 6.. 3 \end{array}$$

$7 \times 2 \times 2 \times 3 = 84$, least common denominator.

$\frac{1}{7}, \frac{5}{12}, \frac{1}{42} = \frac{12}{84}, \frac{35}{84}, \frac{2}{84}, \text{Ans.}$

Ex. 6. $13 \times 3 \times 2 = 78$, least common denominator;
 $\frac{2}{3}, \frac{1}{13}, \frac{2}{26}, \frac{1}{39} = \frac{52}{78}, \frac{6}{78}, \frac{7}{78}, \frac{2}{78}, \text{Ans.}$

Ex. 7. $5 \times 3 \times 2 \times 2 \times 2 = 120$, least common denominator;
 $\frac{1}{5}, \frac{7}{15}, \frac{5}{24}, \frac{3}{80} = \frac{24}{120}, \frac{56}{120}, \frac{25}{120}, \frac{9}{120}, \text{Ans.}$

Ex. 8. $\frac{1}{84} = \frac{1}{84}; 7 \times 2 \times 2 \times 2 \times 3 = 168$, least com. denom
 $\frac{2}{21}, \frac{9}{56}, \frac{1}{28} = \frac{16}{168}, \frac{27}{168}, \frac{6}{168}, \text{Ans.}$

Ex. 9. $\frac{1}{6} = \frac{8}{48}; \frac{2}{12} = \frac{4}{24}; \frac{1}{24} = \frac{2}{48};$

$$\begin{array}{r|l} 2, 2, 3 & 8..24..32 \\ 2, 2, 2 & \hline 2.. 2.. 8 \end{array}$$

$3 \times 2^5 = 96$, least common denominator;

$\frac{1}{6}, \frac{5}{24}, \frac{1}{12} = \frac{16}{96}, \frac{20}{96}, \frac{8}{96}, \text{Ans}$

(96—98)

$$\text{Ex. 4. } \frac{\frac{2}{3} \times \frac{3}{4}}{\frac{1}{2}} = 1; \frac{\frac{2}{3} \times \frac{3}{4}}{\frac{2}{3} \times \frac{1}{2}} = \frac{1}{2},$$

$$1 + \frac{1}{2} = 1\frac{1}{2}; 1 - \frac{1}{2} = \frac{1}{2}; 1\frac{1}{2} \div \frac{2}{3} = 2, \text{ Ans.}$$

$$\text{Ex. 5. } \frac{54\frac{3}{4}}{\frac{1}{8} \times 8\frac{3}{4}} = 31\frac{1}{2}; \frac{1\frac{1}{8}}{\frac{1}{8}} = 2\frac{2}{3}; 31\frac{1}{2} + 2\frac{2}{3} = 34\frac{4}{3}, \text{ Ans.}$$

$$\text{Ex. 6. } \frac{2}{3} \times \frac{3}{4} \times \frac{4}{5} \times \frac{5}{6} = \frac{2}{3}, \text{ Ans.}$$

$$\text{Ex. 7. } \frac{2 - \frac{1}{4} (8\frac{7}{8})^2}{2} \times \frac{(8\frac{7}{8})^2}{12} = \frac{7}{8} \times \frac{60}{7} \times \frac{60}{7} \times \frac{1}{12} = 5\frac{4}{4} = 5\frac{1}{10};$$

$$(2 + \frac{1}{8}) \div (3 + \frac{1}{4}) = \frac{1}{8} \times \frac{7}{2} = \frac{7}{16} = \frac{9}{140};$$

$$\frac{11\frac{3}{2}}{87} = \frac{355}{32} \times \frac{8}{71} = 1\frac{1}{4} = 1\frac{1}{40};$$

$$7\frac{43}{40}, \text{ Ans.}$$

$$\text{Ex. 8. } \frac{7}{9} - \frac{2}{9} = \frac{5}{9}. \text{ A number diminished by } \frac{5}{9} \text{ of itself}$$

will leave a remainder of $1 - \frac{5}{9} = \frac{4}{9}$ of itself; hence

$$144 \div \frac{4}{9} = 28\frac{1}{2}, \text{ Ans.}$$

$$\text{Ex. 9. } \frac{1}{3} + \frac{2}{5} + \frac{1}{8} = \frac{19}{120}; 1 - \frac{19}{120} = \frac{101}{120} \text{ of his money left;}$$

hence, $\$119 \div \frac{101}{120} = \$840, \text{ Ans.}$

$$\text{Ex. 10. } \$42 \times \frac{4}{9} \times \frac{1}{2} \times \frac{87}{8} = \$31\frac{1}{2}, \text{ Ans.}$$

$$\text{Ex. 11. Since the less is } \frac{2}{7} \text{ of the greater, their difference is}$$

$$\frac{7}{7} - \frac{2}{7} = \frac{5}{7} \text{ of the greater; hence, } 25\frac{7}{15} \div \frac{5}{7} = 89\frac{2}{15},$$

the greater number; $89\frac{2}{15} - 25\frac{7}{15} = 63\frac{2}{3}$, the less.

$$\text{Ex. 12. The two shares together must be } \frac{2}{3} + \frac{7}{9} = \frac{13}{9} \text{ times the}$$

greater share; hence, $\$2000 \div \frac{13}{9} = \$1125$, the greater share; $\$2000 - \$1125 = \$875$, the less share.

$$\text{Ex. 13. } \frac{4}{7} \times \frac{5}{8} \times \frac{3}{2} = 10, \text{ Ans.}$$

$$\text{Ex. 14. } \$\frac{65}{8} \div \$\frac{7}{9} = 13\frac{1}{4}, \text{ Ans.}$$

$$\text{Ex. 15. } \frac{2}{3} \times \frac{3}{4} \times \frac{5}{2} = 12\frac{3}{2}, \text{ Ans.}$$

$$\text{Ex. 16. } \frac{1}{5} \times \frac{2}{3} = \text{bushels of corn that can be bought for } \$15;$$

$$\frac{1}{5} \times \frac{2}{3} \times \frac{4}{5} \times \frac{5}{2} = 18 \text{ bushels of barley, Ans.}$$

Ex. 17. $4^8 \times \frac{7}{8} \times \frac{3}{4} = 50\frac{3}{8}$, *Ans.*

Ex. 18. $\frac{11}{2} \times \frac{4}{3} =$ the number of yards of cloth 1 yard wide;
 $\frac{11}{2} \times \frac{4}{3} \times \frac{4}{3} = 34\frac{1}{3}$ yards, *Ans.*

Ex. 19. $\frac{5}{8} \times \frac{4}{3} = \frac{1}{2}$ of the foundry sold for \$2570 $\frac{2}{3}$;
 hence, $2570\frac{2}{3} \times 2 = \$5141\frac{1}{3}$, *Ans.*

Ex. 20. $\$10000 \times \frac{1}{4} \times \frac{4}{5} \times \frac{12}{7} \times \frac{9}{4} \times \frac{7}{5} \times \frac{10}{9} = \$12000$, vessel;
 $\$10000 + \$12000 = \$22000$, *Ans.*

Ex. 21. The second son had $\frac{2}{3}$ of $\frac{5}{8} = \frac{5}{12}$; the third son had
 $1 - (\frac{2}{3} + \frac{5}{12}) = \frac{5}{4}$; the difference between the shares
 of the first and second is $\frac{5}{12} - \frac{2}{3} = \frac{1}{4}$; hence, $\$500$
 $\div \frac{1}{4} = \$12000$, whole estate; $\$12000 \times \frac{5}{4} = \$2500$,
 third son's share.

Ex. 22. $\$60 \times \frac{2}{15} = \$8$, cost of 1 ton; $\$78 \div \$8 = 9\frac{3}{4}$, *Ans.*

Ex. 23. $16\frac{1}{2} \div 30 = \frac{32}{3} \times \frac{1}{30} = \frac{1}{30}$, *Ans.*

Ex. 24. $\frac{2}{3}$ of the whole + $12\frac{1}{4}$ acres = 1st and 2d sons' shares;
 $\frac{2}{3}$ " " " + $12\frac{1}{4}$ " = 3d son's share,
 $\frac{1}{4}$ of the whole + $24\frac{1}{2}$ " = the whole; therefore,
 $24\frac{1}{2}$ acres must be $\frac{1}{4}$ of the whole; $24\frac{1}{2} \times 4 = 98$ acres,
 the whole; and $98 \times \frac{2}{3} + 12\frac{1}{4} = 49$ acres, *Ans.*

Ex. 25. $\$2 \times \frac{4}{3} \times \frac{1}{8} \times \frac{4}{5} = \$\frac{4}{3}$, *Ans.*

Ex. 26. $\$3500 - \$740 = \$2760$, his money before gaining;
 hence, $\$2760 \div \frac{3}{5} = \$4600$, money invested; and
 $\$4600 \times \frac{2}{3} = \$1840$, lost, *Ans.*

Ex. 27. $\frac{2}{3}$ of $\frac{5}{8} = \frac{1}{4}$, *Ans.*

Ex. 28. Since A can do $\frac{1}{8}$ of the work in 1 day, and B can
 do $\frac{1}{6}$ of it in 1 day, they can both do $\frac{1}{8} + \frac{1}{6} = \frac{7}{24}$ of
 the work in 1 day; and if $\frac{7}{24}$ be done in 1 day, $\frac{24}{7}$,
 or the whole work, will require $\frac{24}{7} = 3\frac{3}{7}$ days, *Ans.*

NOTE.—The time required to perform any piece of work will
 always be the reciprocal of that fraction of the work performed
 in 1 unit of time.

Ex. 29. $\frac{3}{4} \times \frac{3}{4} \times \frac{1}{4} = 13$ barrels, sold at \$4 per barrel;
 $13 \div 5 = 18$ barrels, *Ans.*

Ex. 30. The number will be the least common multiple of $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$ and $\frac{1}{5}$, which is 60, *Ans.*

Ex. 31. According to the note above, A will travel round the island, and be again at the point of starting once in $\frac{7}{2}$ days, B once in $\frac{1}{4}$ days, and C once in $\frac{1}{6}$ days; and the least common multiple of $\frac{7}{2}$ days, $\frac{1}{4}$ days, and $\frac{1}{6}$ days, is $1\frac{1}{2} \times 7 = 17\frac{1}{2}$ days, *Ans.*

Ex. 32. The sum of the distances traveled by the two men is $64\frac{1}{2}$ miles, and the difference of these distances is $5\frac{1}{2}$ miles. Hence, by Problem 33, page 64, of the Arithmetic, we have
 $64\frac{1}{2} + 5\frac{1}{2} = 70\frac{1}{2}$; $70\frac{1}{2} \div 2 = 35\frac{1}{4}$ miles, the greater journey; $64\frac{1}{2} - 5\frac{1}{2} = 59\frac{1}{2}$; $59\frac{1}{2} \div 2 = 29\frac{3}{4}$ miles, the less journey.

Ex. 33. $1\frac{1}{10} + \frac{2}{5} = 1\frac{1}{2}$; $1\frac{1}{2} \div 2 = \frac{3}{4}$, the greater;
 $1\frac{1}{10} - \frac{2}{5} = \frac{7}{10}$; $\frac{7}{10} \div 2 = \frac{7}{20}$, the less.

Ex. 34. $1 - \frac{1}{12} = \frac{11}{12}$, the sum of B's and C's shares. And since $\frac{7}{18}$ is the difference of B's and C's shares, we have $\frac{11}{12} \div 2 = \frac{11}{24}$, B's share;
 $\frac{11}{12} - \frac{7}{18} = \frac{5}{24}$; $\frac{5}{24} \div 2 = \frac{5}{48}$, C's share.

Ex. 35. The reciprocal of $\frac{4}{5}$ is $\frac{5}{4}$;
 reversing the fourth operation, $\frac{5}{4} \times \frac{6}{5} = \frac{3}{2}$;
 reversing the third operation, $\frac{3}{2} + \frac{2}{3} = \frac{17}{6}$;
 reversing the second operation, $\frac{17}{6} - \frac{1}{6} = \frac{16}{6}$;
 reversing the first operation, $\frac{16}{6} \times \frac{1}{4} = \frac{4}{3}$, *Ans.*

Ex. 36. $7\frac{1}{2}$ is a quotient and $1\frac{1}{2}$ a divisor, and $\frac{15}{2} \times \frac{2}{3} = \frac{15}{3}$, the dividend; $\frac{15}{3}$ is a product and $5\frac{1}{2}$ a multiplier, and $\frac{15}{3} \div \frac{2}{3} = \frac{25}{2}$, the multiplicand; $\frac{25}{2}$ is a remainder and $\frac{2}{3}$ a subtrahend, and $\frac{25}{2} + \frac{2}{3} = \frac{151}{6}$, the

minuend; $1\frac{2}{8}$ is the sum of two numbers and $1\frac{1}{4}$ is one of them, and $1\frac{2}{8} - \frac{1}{4} = \frac{1}{8}$, the required number, *Ans.*

Ex. 37. $\frac{2}{3} \times \frac{4}{5} \times \frac{7}{2} \times \frac{7}{8} \times \frac{9}{2} = \frac{147}{20}$; $\frac{147}{20} + \frac{25}{8} = \frac{691}{40}$;
 $\frac{2}{3} \times \frac{691}{40} = \frac{691}{60}$; $\frac{691}{60} - \frac{691}{140} = \frac{691}{105} = 6\frac{61}{105}$, *Ans.*

DECIMAL FRACTIONS.

NOTATION AND NUMERATION

(210, page 120.)

- | | |
|---|--------------------------------------|
| Ex. 4. <i>Ans.</i> .496 | Ex. 5. <i>Ans.</i> .0325 |
| Ex. 6. <i>Ans.</i> .000001 | Ex. 7. <i>Ans.</i> .0000074 |
| Ex. 8. <i>Ans.</i> .437549 | Ex. 9. <i>Ans.</i> .3040010 |
| Ex. 10. <i>Ans.</i> .00000024 | Ex. 11. <i>Ans.</i> .08645 |
| Ex. 12. <i>Ans.</i> .495705048 | Ex. 13. <i>Ans.</i> .0000099009 |
| Ex. 14. <i>Ans.</i> .04735901 | Ex. 15. <i>Ans.</i> .000000000001 |
| Ex. 16. <i>Ans.</i> .1001001001001 | |
| Ex. 17. <i>Ans.</i> .000841563436 | |
| Ex. 18. <i>Ans.</i> .000000000000000009 | |
| Ex. 19. <i>Ans.</i> .3 | Ex. 25. <i>Ans.</i> 46.4 |
| Ex. 20. <i>Ans.</i> .105 | Ex. 26. <i>Ans.</i> 205.65 |
| Ex. 21. <i>Ans.</i> .0011 | Ex. 27. <i>Ans.</i> 60.00036 |
| Ex. 22. <i>Ans.</i> .00085 | Ex. 28. <i>Ans.</i> 705.000000005 |
| Ex. 23. <i>Ans.</i> .100004 | Ex. 29. <i>Ans.</i> 300.10001001 |
| Ex. 24. <i>Ans.</i> .0000704 | Ex. 30. <i>Ans.</i> 52.0000000000005 |
| Ex. 31. Twenty-four hundredths. | |
| Ex. 32. Seventy-five thousandths. | |
| Ex. 33. Five hundred three thousandths. | |
| Ex. 34. Seven hundred twenty-five hundred-thousandths | |
| Ex. 35. Forty million four hundred-millionths. | |

- Ex. 36 Two hundred fifty-six ten-millionths
 Ex. 37 Ten thousand seventy-five ten-millionths.
 Ex. 38. Eight, and twenty-five hundredths.
 Ex. 39. Seventy-five, and three hundred sixty-eight thousandths.
 Ex. 40. Forty-two, and six hundred thirty-seven ten-thousandths.
 Ex. 41. Eight, and seventy-four ten thousandths.
 Ex. 42. Thirty, and four thousand seventy-five ten-thousandths.
 Ex. 43. Twenty-six, and five hundred-thousandths.
 Ex. 44. One hundred, and one hundred-millionth

REDUCTION.

(211, page 121.)

Ex. 1.	.1800000	Ex. 2	.012000000000
	.4560000		.000185000000
	.0075000		.000000936000
	.0000010		.000000000007
	.0500000		
	.3789000	Ex. 3.	57.300000
	.5943786		900.000000
	.0010000		4.755500
			100.000001

(212, page 122.)

Ex. 1	$\frac{76}{100} = \frac{19}{25}$, Ans.	Ex. 2.	$\frac{626}{1000} = \frac{313}{500}$, Ans.
Ex. 3	$\frac{12}{100} = \frac{3}{25}$, Ans.	Ex. 4.	$\frac{68}{100} = \frac{17}{25}$, Ans.

(120-122)

$$\text{Ex. 5. } \frac{2625}{10000} = \frac{2}{16}, \text{ Ans.} \quad \text{Ex. 6. } \frac{24}{1000} = \frac{3}{125}, \text{ Ans.}$$

$$\text{Ex. 7. } \frac{32}{100000} = \frac{1}{3125}, \text{ Ans.}$$

$$\text{Ex. 8. } \frac{2624}{1000000} = \frac{41}{15625}, \text{ Ans.}$$

$$\text{Ex. 10. } \frac{57\frac{1}{7}}{100} = \frac{400}{700} = \frac{4}{7}, \text{ Ans.}$$

$$\text{Ex. 11. } \frac{66\frac{2}{3}}{100} = \frac{200}{300} = \frac{2}{3}, \text{ Ans.}$$

$$\text{Ex. 12. } \frac{444\frac{4}{9}}{1000} = \frac{4000}{9000} = \frac{4}{9}, \text{ Ans.}$$

$$\text{Ex. 13. } \frac{24\frac{2}{3}}{1000} = \frac{74}{3000} = \frac{37}{1500}, \text{ Ans.}$$

$$\text{Ex. 14. } \frac{984\frac{3}{8}}{1000} = \frac{787\frac{3}{8}}{8000} = \frac{63}{64}, \text{ Ans.}$$

$$\text{Ex. 15. } 7\frac{4}{10} = 7\frac{2}{5}, \text{ Ans.}$$

$$\text{Ex. 16. } 24\frac{74}{100} = 24\frac{37}{50}, \text{ Ans.}$$

$$\text{Ex. 17. } \frac{2187\frac{3}{8}}{10000} = \frac{35}{100}, \text{ Ans.}$$

$$\text{Ex. 18. } \frac{184}{100} = \frac{41}{25}, \text{ Ans.}$$

$$\text{Ex. 19. } \frac{743\frac{3}{8}}{1000} = \frac{237}{125}, \text{ Ans.}$$

(214, page 123.)

$$\text{Ex. 3. Ans. } .875$$

$$\text{Ex. 4. Ans. } .56$$

$$\text{Ex. 5. Ans. } .8125$$

$$\text{Ex. 9. Ans. } .001796875$$

$$\text{Ex. 11. Ans. } .60625$$

$$\text{Ex. 15. Ans. } 32.714286\ldots$$

$$\text{Ex. 16. Ans. } .245$$

$$\text{Ex. 17. Ans. } 5.783125$$

$$\text{Ex. 20. Ans. } .30007$$

ADDITION

(316, page 125.)

$$\begin{array}{r}
 \text{Ex. 1.} \quad 375 \\
 24 \\
 .536 \\
 .78567 \\
 .4637 \\
 .57439 \\
 \hline
 2.97476, \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 \text{Ex. 2.} \quad 5.3756 \\
 85.473 \\
 9.3 \\
 46.37359 \\
 45.248377 \\
 \hline
 191.675567, \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 \text{Ex. 3.} \quad .5 \\
 .37 \\
 .489 \\
 .6372 \\
 .47856 \\
 .02524 \\
 \hline
 2.50000 = 2.5. \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 \text{Ex. 4.} \quad .4675 \\
 .325125 \\
 .1616 \\
 .2754375 \\
 \hline
 1.2296625, \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 \text{Ex. 5.} \quad 4.65 \\
 7.322 \\
 5.3784125 \\
 2.6487875 \\
 \hline
 19.9992000, \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 \text{Ex. 6.} \quad 4.3785 \\
 2.66666+ \\
 5.42857+ \\
 12.4872 \\
 \hline
 24.9609+, \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 \text{Ex. 7.} \quad .137 \\
 .435 \\
 .836 \\
 .987 \\
 .496 \\
 \hline
 2.841, \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 \text{Ex. 8.} \quad .0102 \\
 .13426 \\
 .000567 \\
 .000003 \\
 .24007 \\
 \hline
 .8851, \text{ Ans.}
 \end{array}$$

SUBTRACTION.

49

$$\begin{array}{r} \text{Ex. 9. } 84.72 \\ 48.44 \\ 152.17 \\ 95.36 \\ 56.18 \\ \hline \end{array}$$

Ans. 386.87 rods.

$$\begin{array}{r} \text{Ex. 10. } \frac{24}{97} = .24748+ \\ \frac{75}{438} = .17224+ \\ \frac{27}{150} = .24666+ \\ \frac{1}{1728} = .00058- \\ \hline \end{array}$$

$$.66691 \pm =$$

$$.6669+, \text{ Ans}$$

$$\begin{array}{r} \text{Ex 11. } 16\frac{6}{19} = 16.316- \\ 15\frac{2}{17} = 15.118- \\ 18\frac{1}{31} = 18.484- \\ 14\frac{7}{45} = 14.155+ \\ \hline \end{array}$$

$$64.07+, \text{ Ans.}$$

$$\begin{array}{r} \text{Ex. 12. } .45 \\ .0275 \\ .009125 \\ .000304 \\ \hline \end{array}$$

$$.486929, \text{ Ans}$$

$$\text{Ex. 13. } 1 \text{ dec. unit of the first order} = .1$$

$$\begin{array}{r} \frac{1}{2} \text{ " " " second " } = .005 \\ \frac{1}{3} \text{ " " " third " } = .0003333333+ \\ \frac{1}{4} \text{ " " " fourth " } = .000025 \\ \frac{1}{5} \text{ " " " fifth " } = .000002 \\ \frac{1}{6} \text{ " " " sixth " } = .00000016666+ \\ \frac{1}{7} \text{ " " " seventh " } = .00000001428+ \\ \hline \end{array}$$

$$\text{Ans. } .1053605143-$$

SUBTRACTION.

(217, page 126)

$$\begin{array}{r} \text{Ex. 4. } 37.456 \\ 24.867 \\ \hline \end{array}$$

$$13.089, \text{ Ans.}$$

$$\begin{array}{r} \text{Ex. 5. } 1.0086 \\ .15 \\ \hline \end{array}$$

$$.8566, \text{ Ans}$$

$$\begin{array}{r} \text{Ex 6 } 1000.000 \\ .001 \\ \hline \end{array}$$

$$999.999, \text{ Ans.}$$

$$\begin{array}{r} \text{Ex. 7. } 36.75 \\ 22.48 \\ \hline \end{array}$$

$$14.27, \text{ Ans}$$

(125, 126)

$$\begin{array}{r} \text{Ex. 8. } .56875 \\ .55992 \\ \hline \end{array}$$

.00883, *Ans.*

$$\begin{array}{r} \text{Ex 9. } 7.33333+ \\ 5.5625 \\ \hline \end{array}$$

1.7708+, *Ans*

$$\begin{array}{r} \text{Ex. 10. } \frac{8}{9} = .9939819+ \\ \frac{7}{8} = .9448094+ \\ \hline \end{array}$$

.0491725±, *Ans.*

$$\begin{array}{r} \text{Ex 11 } 1. \\ .000000000001 \\ \hline \end{array}$$

Ans. .999999999999

$$\text{Ex. 12. } 57436.00$$

536.74

1756.19

5678.47

9572.15

7536.59

4785.94

Ans. 29569.92 acres.

$$\text{Ex 13. } \frac{44321}{12345} = 4.400243+$$

$$\frac{12345}{67891} = .227260+$$

4.17298+, *Ans*

MULTIPLICATION.

(219, page 127.)

$$\text{Ex. 2. } \text{Ans. } .10464$$

$$\text{Ex. 5. } \text{Ans. } 9.3654$$

$$\text{Ex. 8. } \text{Ans. } 104.976$$

$$\text{Ex. 9. } \text{Ans. } 17.019$$

$$\text{Ex. 11. } \text{Ans. } 360.$$

$$\text{Ex. 12. } \text{Ans. } 1.$$

$$\text{Ex 13. } \text{Ans. } 57600.$$

$$\text{Ex. 15. } \text{Ans. } 15.15$$

$$\text{Ex 18. } \text{Ans. } 4.626$$

$$\text{Ex. 20. } \text{Ans. } 168.48 \times 27.37.$$

=4612.14 pounds, *Ans*

$$\text{Ex. 21. } 2.8 \times 36 = 100.8 \text{ bushels of oats for 36 bushels of corn; } 100.8 + 48 = 148.8, \text{ Ans.}$$

(126—128)

CONTRACTED MULTIPLICATION

(222, page 131.)

Ex. 2 36.275

763.4

1451

109

22

2

158.4±, Ans**Ex. 3.** .24367

57.63

731

146

17

1

8.95±, Ans**Ex. 4.** 4256.785

46500.

21284

2554

170

24.008±, Ans**Ex. 5.** 357.84327

608700.1

357 8433

2 5049

2863

21

360.6366±, Ans**Ex. 6** 400.756

85763.1

400 76

120 23

24 05

2 80

20

8

548.07±, Ans.**Ex. 7.** 432.5672

666660.1

432 567

25 954

2 595

260

26

3

461.405±, Ans.

$$\begin{array}{r} \text{Ex. 8.} \quad 48.4367 \\ + 31531.2 = 2_{17}^6 \\ \hline \end{array}$$

96873

4844

1453

242

5

1

 $103.418 \pm, \text{Ans.}$

$$\begin{array}{r} \text{Ex. 9.} \quad 7.04424 = 7_{11}^1 \\ + 94658.3 = 3_{11}^1 \\ \hline \end{array}$$

21133

5635

852

42

8

1

 $27.166 \pm, \text{Ans}$

$$\begin{array}{r} \text{Ex. 10.} \quad 142.8373 + \\ 53025.2 \\ \hline \end{array}$$

28567

7142

286

4

1

 $\text{Ans. } 360.00 \pm \text{ degrees.}$

$$\begin{array}{r} \text{Ex. 11.} \quad 35.8756 \\ ,8833.8 \\ \hline \end{array}$$

28700

1076

108

29

3

 $\text{Ans. } 299.16 \pm \text{ pounds}$

$$\begin{array}{r} \text{Ex. 12.} \quad 478.7862 \\ 65390.1 \\ \hline \end{array}$$

47879

4308

144

24

8

 $\text{Ans. } 523.58 \pm \text{ yards.}$

$$\begin{array}{r} \text{Ex. 13.} \quad 6377397.6 \\ 643126000. \\ \hline \end{array}$$

382644

12755

638

191

25

4

Equatorial radius, $3962.57 \pm \text{ miles}$

$$\begin{array}{r}
 6356078.96 \\
 643126000. \\
 \hline
 881365 \\
 12712 \\
 636 \\
 191 \\
 25 \\
 4 \\
 \hline
 \end{array}$$

Polar radius, $3949.33 \pm$ miles

DIVISION.

(224, page 133.)

- | | |
|--|---------------------|
| Ex. 1. Ans. .2 | Ex. 7. Ans. .8666+ |
| Ex. 9. Ans. .00666+ | Ex. 10. Ans. .0075 |
| Ex. 11. Ans. .0000436 | Ex. 12. Ans. .8333+ |
| Ex. 13. Ans. .6455 | Ex. 14. Ans. 6.165 |
| Ex. 15. $16.2 \div 2.7 = 6$, Ans. | |
| Ex. 16. $674 \div 36.34 = 18.547$ days, Ans. | |
| Ex. 17. $5280 \div 14.25 = 370.5$ +, Ans. | |

CONTRACTED DIVISION.

(226, page 135.)

Contracted decimal division is most readily performed by the method of inverting the quotient, described in Note 2, page 135, of the Arithmetic.

(132—135)

Ex. 1. 4.3267)27.3782

823.6 25960

1418

Ans. 6.328±

1298

120

87

88

84

Ex. 2. 1.008675)487.24

64.584 401 47

8577

Ans. 485.46±

8029

548

502

46

40

6

Ex. 3. 75.480)8.47326

33211. 75430

9302

Ans. 11233

7543

1759

1509

250

226

24

23

Ex. 4. .075637).8487564

122.11 75637

9238

Ans. 11.221±

7564

1674

1513

161

151

10

8

in the following operations, Abbreviated Long Division is combined with decimal contraction, (see Arithmetic, 112, page 50).

Ex. 5. 1.436666+)478.325

249.233 47 325

4 225

Ans. 332.942±

1 352

59

2

Ex. 6. 756.3452)8972.436

9268.11 1408 98

652 63

Ans. 11.8629±

47 56

2 18

67

(135, 136)

Ex. 7	1.007638)1.000000	Ex. 8.	44.786546).95372843
	5 24299.		93 130
			2443
Ans.	.992425±		428
			25
			5
			84
			8
Ex. 9.	5737)4278.0		
	8417. 257 1		
	27 6		
Ans.	.7448±		47
			1

CIRCULATING DECIMALS.

REDUCTION.

(238, page 139.)

Ex. 1.	$45 = \frac{45}{1} = \frac{90}{2}, \text{ Ans.}$	Ex. 2.	$.66 = \frac{66}{100} = \frac{33}{50}, \text{ Ans.}$
Ex. 3.	$.279 = \frac{279}{1000} = \frac{111}{400}, \text{ Ans.}$		
Ex. 4.	$.423 = \frac{423}{1000} = \frac{141}{333}, \text{ Ans.}$		
Ex. 5.	$.923076 = \frac{923076}{1000000} = \frac{23076}{25000}, \text{ Ans.}$		
Ex. 6.	$.95121 = \frac{95121}{100000} = \frac{31707}{33333}, \text{ Ans.}$		
Ex. 7.	$4.72 = \frac{472}{100} = \frac{118}{25}, \text{ Ans.}$		
Ex. 8.	$2.297 = \frac{2297}{1000} = \frac{2297}{1000}, \text{ Ans.}$		
Ex. 9.	$2.97 = 2.972 = \frac{2972}{1000} = \frac{743}{250}, \text{ Ans.}$		
Ex. 10.	$15.0 = 15.015 = \frac{15015}{1000} = 15\frac{15}{200}, \text{ Ans.}$		

(239, page 141.)

Ex. 1.	$.51 = \frac{51}{100} = \frac{51}{100}, \text{ Ans.}$
Ex. 2.	$.046 = \frac{46}{1000} = \frac{23}{500}, \text{ Ans.}$

(136—141)

- Ex. 3. $.64\dot{7}2 = \frac{6472 - 64}{9900} = \frac{6408}{9900} = \frac{178}{2475}, \text{ Ans.}$
 Ex. 4. $.659\dot{0} = \frac{6590 - 65}{9900} = \frac{6525}{9900} = \frac{29}{44}, \text{ Ans.}$
 Ex. 5. $.046\dot{1}8 = \frac{4618 - 4}{99900} = \frac{4614}{99900} = \frac{154}{3525}, \text{ Ans.}$
 Ex. 6. $.100\dot{1} = \frac{1004 - 100}{9900} = \frac{904}{9900} = \frac{113}{1125}, \text{ Ans.}$
 Ex. 7. $.928571\dot{4} = \frac{9285714 - 9}{9999990} = \frac{9285705}{9999990} = \frac{13}{14}, \text{ Ans.}$
 Ex. 8. $5.2\dot{7} = \frac{527 - 52}{90} = \frac{475}{90} = \frac{95}{18}, \text{ Ans.}$
 Ex. 9. $7.01\dot{2}6 = 7\frac{125}{9900} = 7\frac{5}{396}, \text{ Ans.}$
 Ex. 10. $1.5823170\dot{7} = \frac{158231707 - 1582}{99999900} = \frac{158230125}{99999900}, \text{ Ans.}$
 Ex. 11. $2.029268\dot{8} = \frac{20292688 - 20}{999990} = \frac{20292668}{999990}, \text{ Ans.}$

(240, page 142.)

- Ex. 1. $.4\dot{3} = .4333333\dot{3}$
 $.5\dot{7} = .5757575\dot{7}$
 $.456\dot{7} = .4567567\dot{5}$
 $.503\dot{7} = .5037373\dot{7}$
- Ex. 2. $.57\dot{8} = .5788\dot{8}$
 $.3\dot{7} = .3737\dot{3}$
 $.248\dot{5} = .2485\dot{5}$
 $.0\dot{4} = .040\dot{4}$
- Ex. 3. $\dot{1}.34 = 1.341341\dot{3}$
 $4.5\dot{6} = 4.564564\dot{5}$
 $3.\dot{4}1 = 3.41414\dot{1}$
- Ex. 4. $.567\dot{4} = .567456745674\dot{5}$
 $.3\dot{4} = .341111111111\dot{4}$
 $.24\dot{7} = .247247247247\dot{2}$
 $.6\dot{7} = .676767676767\dot{6}$
- Ex. 5. $\dot{1}.24 = 1.24124124124124\dot{4}$
 $.057\dot{8} = .05785785785785\dot{5}$
 $\dot{4} = .441111111111111\dot{4}$
 $.473214\dot{7} = .4732147321473214\dot{7}$
- Ex. 6. $\dot{7} = .777777777777\dot{7}$
 $.456\dot{7} = .456777777777\dot{7}$
 $.2\dot{4} = .242424242424\dot{2}$
 $.346789\dot{0} = .346789467894\dot{6}$

(141, 142)

$$\begin{array}{rcl}
 \text{Ex. 7} & .\dot{8} & = .888888888888888888 \\
 & .\dot{3}\dot{6} & = .363636363636363636 \\
 & .485\dot{7} & = .485748574857485748 \\
 & .\dot{3}456\dot{7} & = .345673456734567345 \\
 & .278467894\dot{3} & = .27846789432784678943
 \end{array}$$

ADDITION AND SUBTRACTION.

(242, page 143.)

Ex. 1. 2.4444444 3232323 5675675 70565656 4377777 $14.7695877, \text{Ans.}$	Ex. 2. $.4787878787878$ 3213213213213 7856485648564 3222222222222 5555555555555 4326432643264 $2.8961788070698, \text{Ans}$
Ex. 3. $.7854854$ 5959595 $.1895258, \text{Ans}$	Ex. 4. 57.0587 27.3131 $29.7455, \text{Ans}$
Ex. 5. $.55$ 32 12 $.99=1, \text{Ans}$	Ex. 6. $.4387$ 8633 2111 3554 $1.8686=1.86, \text{Ans}$

Ex. 7. 3.6537537

3.1351351

2.5646464

$.5353535$

$9.8888888 = 9.8, \text{ Ans.}$

Ex. 8. $.43243$

$.25000$

$.18243, \text{ Ans}$

Ex. 9. 7.24574

2.63463

$4.61111 = 4.61, \text{ Ans.}$

Ex. 10. $.99000$

$.43343$

$\text{Ans. } .55656$

Ex. 11. 4.638638

8.318318

$.016016$

$.545454$

$.454545$

$18.972972 = 13.972 = 13\frac{72}{99} = 13\frac{8}{11}, \text{ Ans.}$

Ex. 12. $.44$

$.23$

$.21 = \frac{21}{99} = \frac{7}{33}, \text{ Ans}$

MULTIPLICATION AND DIVISION.

(244, page 144.)

Ex. 1 $3.4 = \frac{34}{10}$; $72 = \frac{72}{1}$; $\frac{34}{10} \times \frac{72}{1} = \frac{2448}{10} = 244.8, \text{ Ans.}$

Ex. 2 $.0432 = \frac{432}{10000}$; $\frac{432}{10000} \times \frac{1}{1} = \frac{432}{10000} = .00432, \text{ Ans.}$

Ex. 3. $.154 = \frac{154}{1000}$; $.2 = \frac{2}{10}$; $\frac{154}{1000} \times \frac{2}{10} = \frac{308}{10000} = .0308, \text{ Ans.}$

Ex. 4. $4.5724 = \frac{45724}{10000}$; $.7 = \frac{7}{10}$;
 $\frac{45724}{10000} \times \frac{7}{10} = \frac{320068}{100000} = 3.20068, \text{ Ans.}$

Ex. 5. $4.37 = \frac{437}{100}$; $.27 = \frac{27}{100}$; $\frac{437}{100} \times \frac{27}{100} = \frac{11799}{10000} = 1.1799, \text{ Ans.}$

Ex. 6. $56.6 = \frac{566}{10}$; $\frac{566}{10} \times \frac{1}{1} = \frac{566}{10} = 56.6, \text{ Ans.}$

Ex. 7. $\frac{438571}{1000000} \times \frac{2}{1} = \frac{877142}{1000000} = .877142, \text{ Ans.}$

Ex. 8. $\frac{714388}{1000000} \times \frac{2}{1} = \frac{1428776}{1000000} = 1.428776, \text{ Ans.}$

(143, 144)

- Ex 9. $3.456 = \frac{3456}{1000}$; $125 = \frac{125}{1}$;
 $\frac{3456}{1000} \times \frac{125}{1} = \frac{432000}{1000} = 432$, *Ans.*
- Ex 10. $9.17045 = \frac{917045}{100000}$, $3.36 = \frac{336}{100}$;
 $\frac{917045}{100000} \times \frac{336}{100} = \frac{308127120}{10000000} = 3.0812712$, *Ans.*
- Ex. 11. $\frac{24}{99} \times \frac{57}{99} = \frac{1368}{9801} = .1395775941230486685032$, *Ans.*

UNITED STATES MONEY.

NOTATION AND NUMERATION.

(250, page 146.)

- Ex. 2. *Ans.* \$4.07 Ex. 3. *Ans.* \$10.04
 Ex. 4. *Ans.* \$16.004 Ex. 5. *Ans.* \$.31 $\frac{1}{2}$, or \$.316
 Ex. 7. *Ans.* \$1000.011 Ex. 8. *Ans.* \$32.584
 Ex. 9. *Ans.* \$.06 $\frac{1}{2}$, or \$.0625
- Ex. 10 Twenty-one dollars eighteen cents; one hundred sixty-four dollars five cents; seven dollars ninety cents; ten dollars one cent; two hundred one dollars twenty cents one mill; five dollars thirty-seven and one-half cents; eighty-one and one-fourth cents; fifteen dollars eight and one-third cents; ninety-six dollars five mills.

OPERATIONS IN UNITED STATES MONEY.

(252, page 147.)

- | | | | |
|------|------------------------|--------|------------------------------------|
| Ex 1 | \$3475.50 | Ex. 2. | \$4.62 $\frac{1}{2}$ |
| | 316.20 | | 1.75 |
| | 1287.375 | | 87 $\frac{1}{2}$ |
| | 207.125 | | 1.00 |
| | <hr/> | | .62 $\frac{1}{2}$ |
| | \$5280.20, <i>Ans.</i> | | <hr/> |
| | | | \$8.87 $\frac{1}{2}$, <i>Ans.</i> |

Ex. 3. \$390.375

\$150.000

175.84

62.50\$ 2.035, *Ans.*

Ex. 4. \$3800

190.87½\$3990.87½, *Ans.*

Ex. 5. \$50.000

\$10.75

5.50

2.375

.875

.625\$29.875, *Ans.*

Ex. 6. \$.375 × 150 = \$56.25

8.875 × 4 = 15.50

\$71.75

\$.06½ × 84 = 5.25

.62½ × 25 = 15.62½

5.87½ × 2 = 11.75

\$39.12½, Ans.

Ex. 7. \$31.25 × 126.25 = \$3945.31½

33.75 × 138.25 = 4665.93½

\$8611.25\$8611.25 — \$6726 = \$1885.25, *Ans.*

Ex. 8. \$.80 × 28½ × 40 = \$ 912.

.11½ × 29 × 300 = 1000.50

3.87½ × 36½ × 20 = 2809.37½

.06½ × 30½ × 112 = 213.50\$11000 — \$4935.37½ = \$6064.62½, *Ans.*Ex. 9. \$2189.25 ÷ 139 = \$15.75, *Ans.*Ex. 10. \$41.748 ÷ 396 × \$.113, *Ans.*

Ex. 11. \$4.50 × 10.75 = \$48.375;

\$48.375 ÷ 7.74 = \$6.25, *Ans.*Ex. 12. \$4885.80 ÷ \$287.40 = 17, *Ans.*

(147, 148)

Ex. 13 $\$3.75 + \$2.875 = \$6.625$, cost of a calf and a sheep
 $\$265 \div \$6.625 = 40$, *Ans.*

Ex. 14.

9632	128
	1730.75

 23, *Ans.*

Ex. 15.

41.25	125
2.5	112.20

 136, *Ans.*

Ex. 16. $\$2475.36 - \$1936.40 = \$538.96$, the amount his money has *diminished* since the beginning of the month, which, by the conditions, must be $\frac{2}{3} - \frac{1}{3} = \frac{1}{3}$ of what he had at the beginning of the month. Hence, $\$538.96 \div \frac{1}{3} = \$1616.88$, *Ans.*

Ex. 17. $\$3200 - \$138 \times 12 = \$1544$, saves yearly;
 $\$1544 \times 8 = \$12352$, *Ans.*

Ex. 18. $\$45.75 \times 120 = \$5490$; $\$5490 - \$1026 = \$4464$;
 $\$4464 \div 120 = \$37.20$, *Ans.*

Ex. 19. $\$6.25 \times 425 = \$2656.25$;
 $\$3088.25 - \$2656.25 = \$432$; $\$432 \div \$4.50 = 96$;
 $425 + 96 = 521$ barrels, *Ans.*

Ex. 20. $\$6315.12 \div 36 = \$175.42$, wages for 1 engineer;
 $\$21927.50 \div \$175.42 = 125$, *Ans.*

Ex. 21. $\$2538 + \$750 - \$1378.56 = \$1909.44$, *Ans.*

Ex. 22. $\$1.875 \times 22 = \$41.25$; $\$41.25 - \$25.75 = \$15.50$;
 $\$1116 \div \$15.50 = 72$ months; $72 \div 12 = 6$ years, *Ans.*

Ex. 23. $(\$453.75 \div 27.5) + \$3.625 = \$20.125$, *Ans.*

Ex. 24. $\$.95 + \$1.37 + \$.73 = \$3.05$, cost of 1 bushel of each kind; $\$70.15 \div \$3.05 = 23$ bushels of each kind;
 $23 \times 3 = 69$ bushels, *Ans.*

Ex. 25. $375.5 \div 2 = 187.75$; $\$1032.625 \div 187.75 = \$5.50$
 profit per acre; $\$22.25 + \$5.50 = \$27.75$, *Ans.*

Ex. 26. $\$11.37\frac{1}{2} = \$\frac{91}{8}$

$$\begin{array}{r|l} 8 & \$91 \\ 7 & 2 \\ 8 & 161 \\ \hline 32 & 2093 \end{array}$$

 $\$65.40\frac{1}{2}$, *Ans.*

Ex. 27. $\$46.75 = \$1\frac{3}{4}$

$$\begin{array}{r|l} 4 & 3 \\ 51 & 8 \\ 4 & 187 \\ \hline 2 & 11 \end{array}$$

5.5 hundred pounds

Ex. 28. $\$62.50 - (\$3.25 \times 12\frac{1}{2}) = \$21.875$;

$\$21.875 \div \$1.25 = 175$ pounds, *Ans.*

Ex. 29. $\$10.04 \div 16 = \$6.275$; $\$17.50 \div 20 = \$8.75$;

$\$.875 - \$.6275 = \$.2475$;

$\$.2475 \times 320 = \$79.20$, *Ans.*

PROBLEMS

INVOLVING THE RELATION OF PRICE, COST, AND QUANTITY

(257, page 151.)

Ex. 1. $\$1.32 \times 187 = \$246.84$, *Ans.*

Ex. 2. $\$1\frac{1}{8} \times 70\frac{1}{2} \times 5 = \$66.09\frac{3}{8}$, *Ans.*

Ex. 3. $\$501.875 \div 365 = \$1.375$, *Ans.*

Ex. 4. $\$18.48 \div \$1.05 = 176$, *Ans.*

Ex. 5. $\$17.75 \div 2 = \$8.875$;

$\$8.875 \times .1625 \times 140 = \$201.906\frac{1}{4}$, *Ans.*

Ex. 6. $\$16.50 \times 32.40 = \$534.60$, *Ans.*

Ex. 7. $\$66.44 \times 842.75 = \$55992.31$, *Ans.*

Ex. 8. $\$10660.125 \div 325.5 = \$32.75$, *Ans.*

Ex. 9. $\$1.94 \times 8.40 = \$16.296$; $\$12.50 \times 1.262 = \$15.775$

$\$16.296 + \$15.775 = \$32.071$, *Ans.*

Ex. 10. $\$37.6875 \div \$1.50 = 25.125 = 25\frac{1}{8}$ bushels, *Ans.*

(149-151)

- Ex. 11. $\$3.875 \div 2 = \$1.9375$;
 $\$1.9375 \times 2.172 = \$4.208\frac{1}{4}$, *Ans.*
- Ex. 12. $\$.37\frac{1}{2} = \$.3$; $\$.3 \times \frac{5}{8} \times 4\frac{1}{2} = \$106.87\frac{1}{2}$, *Ans.*
- Ex. 13. $\$81.25 \div 32.5 = \$2.50$, *Ans.*
- Ex. 14. $\$9.375 \times 24.240 = \$227.25$, *Ans.*
- Ex. 15. $\$4234\frac{3}{8} \div \$5\frac{5}{8} = 752\frac{7}{8}$, *Ans.*
- Ex. 16. $\$20.25 \times .972 = \$19.683$
 $2.875 \times 15.75 = 45.281\frac{1}{4}$
 $7.50 \times 8.756 = 65.670$

 $\$130.634\frac{1}{4}$, *Ans.*
- Ex. 17. $\$4.625 \times 10.46 = \$48.37\frac{3}{4}$, *Ans.*
- Ex. 18. $\$4.70 \div 2 = \$2.35$; $\$5.25 \div 2 = \$2.62\frac{1}{2}$;
 $\$2.35 \times 5.840 = \$13.724$
 $2.62\frac{1}{2} \times 4.376 = 11.487$

 $\$25.211$, *Ans.*
- Ex. 19. $\$2 \div \$2.50 = \frac{4}{5}$ yards, *Ans.*
- Ex. 20. $\$5.75 \times 37 = \$212.75$, *Ans.*
- Ex. 21. $\$.96 \times 38.40 = \$36.864$, *Ans.*
- Ex. 22. $\$2.875 \times 27\frac{3}{4} \times 9 = \$715.87\frac{1}{2}$, *Ans.*
- Ex. 23. $\$80.745 \div \$4.2 = 192\frac{1}{4}$ pounds, *Ans.*
- Ex. 24. $\$15.50 \times .327 = \$ 5.0685$
 $1.625 \times 6.72 = 10.92$
 $4.25 \times 1.108 = 4.709$

 $\$20.6975$, *Ans.*
- Ex. 25. $\$15\frac{1}{4} \div \$\frac{7}{8} = 18$, *Ans.*
- Ex. 26. $\$5 \times 18.962 = \$94.81$, *Ans.*
- Ex. 27. $\$27.90 \div 15.5 = \$1.80$, *Ans.*
- Ex. 28. $\$125.38 \times 27.86 = \$3493.0868$, *Ans.*
- Ex. 29. $\$13.125 \div .7 = \$18.75$, *Ans.*

Ex. 30. $\$12.75 \div 2 = \$6.375$; $\$15.50 \div 2 = \$7.75$;

$$\$6.375 \times .720 = \$4.59$$

$$\$7.75 \times .912 = 7.068$$

$$\$11.658, \text{ Ans}$$

LEDGER ACCOUNTS.

(258, page 153)

Ex. 1. *Ans.* \$3434.80

Ex. 2. *Ans.* \$7222.55

Ex. 3. *Ans.* \$73785.18

Ex. 4. *Ans.* \$750026.82

ACCOUNTS AND BILLS.

(267, page 155.)

Ex. 1.

$$\$2.85 \times 10 = \$28.50$$

$$1.12\frac{1}{2} \times 16 = 18.00$$

$$.14 \times 72 = 10.08$$

$$.16\frac{1}{2} \times 42 = 6.93$$

$$.40 \times 12 = 4.80$$

$$56 \times 24\frac{1}{2} = 13.72$$

$$\text{Ans. } \$82.03$$

Ex. 2.

$$\$1.25 \times 125 = \$156.25$$

$$1.75 \times 275 = 481.25$$

$$1.12\frac{1}{2} \times 180 = 202.50$$

$$.87\frac{1}{2} \times 210 = 183.75$$

$$.84 \times 80 = 67.20$$

$$.90 \times 95 = 85.50$$

$$1.06 \times 175 = 185.50$$

$$30.50 \times 8 = 244.00$$

$$35.75 \times 3 = 107.25$$

$$.10\frac{1}{2} \times 958 = 100.59$$

$$.37\frac{1}{2} \times 40 = 15.00$$

$$\text{Ans. } \$1828.79$$

(152-155)

Ex. 3 \$27 50 $\times 40 =$ \$1100.00

19.20 $\times 25 =$ 480.00

48.10 $\times 16 =$ 769.60

17.75 $\times 12 =$ 213.00

26.30 $\times 20 =$ 526.00

31.85 $\times 15 =$ 477.75

3.87 $\frac{1}{2}$ $\times 36 =$ 139.50

4.12 $\frac{1}{2}$ $\times 42 =$ 173.25

2.90 $\times 25 =$ 72.50

\$3951.60, Ans.

Ex. 4. \$6.25 $\times 150 =$ \$937.50

7.16 $\times 275 =$ 1969.00

5.87 $\frac{1}{2}$ $\times 170 =$ 998.75

1.62 $\frac{1}{2}$ $\times 326 =$ 529.75

.82 $\times 214 =$ 175.48

.91 $\times 300 =$ 273.00

1.06 $\times 500 =$ 530.00

\$5413.48, Ans

	Dr.	Cr.
Ex. 5	\$64.30 $\times 24 =$ \$1543.20	\$17.60 $\times 20 =$ \$352.00
	10.25 $\times 15 =$ 153.75	3.12 $\frac{1}{2}$ $\times 50 =$ 156.25
	7.78 $\times 7 =$ 54.46	9.37 $\frac{1}{2}$ $\times 42 =$ 393.75
	8.45 $\times 25 =$ 211.25	1000.00
	16.12 $\frac{1}{2}$ $\times 14 =$ 225.75	3.10 $\times 75 =$ 232.50
	5.90 $\times 27 =$ 159.30	.87 $\frac{1}{2}$ $\times 36 =$ 31.50
	.09 $\frac{1}{2}$ $\times 1840 =$ 174.80	
	<u>\$2522.51</u>	<u>\$2166.00</u>
		2522.51
		<u>Balance, \$356.51</u>

(156, 157)

	<i>Dr.</i>	<i>Cr.</i>
Ex. 6	\$.23 × 896 = \$206.08	\$2.25 × 61 = \$137.25
	.09 $\frac{1}{4}$ × 872 = 80.66	.22 × 70 = 15.40
	.11 $\frac{3}{8}$ × 481 $\frac{1}{2}$ = 54.77	.87 $\frac{1}{2}$ × 56 = 49.00
	.13 $\frac{1}{2}$ × 509 $\frac{3}{4}$ = 68.82	.68 $\frac{3}{4}$ × 31 = 21.31
	.16 $\frac{3}{4}$ × 81 = 13.50	
	1.40 × 15 = 21.00	
	12 $\frac{1}{2}$ × 963 $\frac{1}{8}$ = 120.42	
	\$565.25	\$222.96
		565.25
		Note to Bal., \$342.29

PROMISCUOUS EXAMPLES.

Ex. 1. \$4.875 × 12 $\frac{5}{8}$ = \$61.54 +, *Ans.*

Ex. 2. \$33.75 + \$.375 = 90; 90 ÷ 2 $\frac{1}{2}$ = 36, *Ans.*

Ex. 3. 36 × 36 = 1296; \$97.20 ÷ 1296 = \$.075, *Ans.*

Ex. 4. \$5.35 ÷ .625 = \$8.56, *Ans.*

Ex. 5. .0 $\frac{1}{4}$ = .033 $\frac{1}{3}$

.00 $\frac{1}{8}$ = .008 $\frac{1}{8}$

Or, $\frac{1}{30} - \frac{5}{60} = \frac{1}{60} = .025$, *Ans.*

.025, *Ans.*

Ex. 6 814 $\frac{22}{100}$ × 26 $\frac{15}{100}$ = 814.495 × 26.46875
= 21558.66 +, *Ans.*

Ex. 7 \$75 × 5 = \$375; \$68 × 12 = \$816; 5 + 12 = 17;
\$375 + \$816 + \$118 = \$1309;
\$1309 ÷ 17 = \$77, *Ans.*

Ex. 8. \$.625 × .8 = \$.50, *Ans.*

Ex. 9. \$ 87 $\frac{1}{2}$ + \$.18 $\frac{3}{4}$ + \$.10 $\frac{1}{4}$ = \$1.165;
\$27.96 ÷ \$1.165 = 24, *Ans.*

(157, 158)

Ex 10. $13543.47 + 365.25 = 37.08$ miles in 1 day;
 $37.08 \times \frac{7}{8} = 32.445$ miles, *Ans.*

Ex. 11. $\$5.12\frac{1}{2} \times 100 = \$512.50$ $\$6.50 \times 75 = \$487.50$
 $1.06\frac{1}{4} \times 250 = 265.62\frac{1}{2}$ $1.37\frac{1}{2} \times 250 = 343.75$
 $221.87\frac{1}{2}$

 $\$831.25$
 $\$1000.00 - \$831.25 = \$168.75$, to be
realized on the remaining 25 barrels of flour; hence
 $\$168.75 \div 25 = \$6.75$, *Ans.*

Ex. 12. $4580.289 \div 114.45 = 40.02$ bushels from 1 acre;
 $120.06 \div 40.02 = 3$ acres, *Ans.*

Ex. 13. $.017226 + .030625 = .5625 \pm$, *Ans.*

Ex. 14. $13.5 \div .0225 = 600$, *Ans.*

Ex. 15. $8.5 \div 5 = 1.7$ rods, his daily work;
 $59.5 - 8.5 = 51$; $51 \div 1.7 = 30$ days, *Ans.*

Ex. 16. $\$.375 \times 28.5 = \$10.68\frac{3}{4}$; $12520 \div 2000 = 6.26$ tons;
 $75 \times 4.53 = 3.39\frac{3}{4}$

 $\$14.085 \div 6.26 = \$2.25$, *Ans.*

Ex. 17. $1826 + 1478 + 1921 = 5225$; $\$8.80 \div 2 = \$4.40$;
 $\$4.40 \times 5.225 = \$22.99$ $\$.09 \times 31 = \$2.79$
 $5.25 \times 2.81 = 14.75\frac{1}{4}$ $4.50 \times 6\frac{1}{2} = 29.25$

 $\$37.74\frac{1}{4}$ — $\$32.04 = \$5.70\frac{1}{4}$, *Ans.*

Ex. 18. $\$122.50 \div 35 = \$3.50$; $\$3.50 \times 29 = \$101.50$, *Ans.*

Ex. 19. $\$.56\frac{1}{4} \times 1200 = \$675$
 168.675

 $\$843.675$
 $\$60 \times 875 = 5 = 225.30$ $1200 - 375.5 = 824.5$;

 $\$818.375 \div 824.5 = \$.75$, *Ans.*
(158, 159)

Ex. 20. $\begin{array}{r l} 1680 & \\$2.856 \\ & 2000 \\ \hline & \\$3.40, \text{ Ans.} \end{array}$	Ex. 21. $\begin{array}{r l} 8 & \\$127 \\ .125 & 25.42 \\ \hline & \\$3228.34, \text{ Ans.} \end{array}$
--	--

Ex. 22. $(\$100 \times 150) - \$3900 = \$11100$, cost of whole;
 $\$11100 \div 150 = \$74$, cost per acre;
 $\$11100 - \$2250 = \$8850$, sold for;
 $\$8850 \div 150 = \$59$, sold for, per acre.

Ex. 23. $\$14.375 \times 212.5 = \$3054.68\frac{1}{4}$, cost;
 $1.75 \times 2125 = \$3718.75$, avails;
 $\$3054.68\frac{1}{4} - \$3718.75 = \$664.06\frac{1}{4}$, Ans.

Ex. 24. $\$545 \div 10 = \$54.50$, cost of 1 acre;
 $\$17712.50 \div \$54.50 = 325$, Ans.

Ex. 25. $224.56 \times 7 \times \frac{1}{4} \times \frac{1}{4} = 196.49$, Ans.

Ex. 26. $\$169.8125 - \$39.1875 = \$130.625$;
 $\$130.625 \div 104.5 = \$1.25$, Ans.

Ex. 27. $\$6.975 \div .93 = \$7.50$, Ans.

Ex. 28. $\$4000 \times .375 \times .12 = \$180$, Ans.

Ex. 29. $\left(\frac{1\frac{1}{4}}{4\frac{1}{2}} \div \frac{2\frac{1}{2}}{2\frac{1}{4}} \right) \times \frac{1}{2} \times \frac{1}{2} = \frac{7}{4} \times \frac{2}{9} \times \frac{1}{4} \times \frac{3}{4} \times \frac{1}{5} \times \frac{1}{2} = \frac{1}{20} = .15$, Ans

Ex. 30. $\$.33\frac{1}{3} \times 375 = \$125$; $\$125 \div 7.5 = \$16.66\frac{2}{3}$, Ans.

Ex. 31. $1 + .84 = 1.84$ times the sum invested;
 $1.84 \times 2 = 3.68$ times the sum invested, Ans.

Ex. 32. $\frac{1}{10} = .3$; $\frac{3}{5} = .6$; $1 - (.3 + .6) = .1$. Now, if he purchases .3 of a bushel of barley, .6 of a bushel of wheat, and .1 of a bushel of oats, he will have 1 bushel of grain, worth

$$\begin{array}{r} \$.625 \times .3 = \$.1875 \\ 1.875 \times .6 = 1.125 \\ .375 \times 1 = .0375 \\ \hline \$1.35 \end{array}$$

(159, 180)

And for \$54, he can purchase as many bushels as \$1.35 is contained times in \$54. Therefore,

$$\$54 \div \$1.35 = 40, \text{ Ans}$$

Ex. 33. $19\frac{1}{3} \times 27 = 522$ yards;

$$\$4.31\frac{1}{4} \times 522 = \$2251.12\frac{1}{2}$$

$$881.87\frac{1}{2}$$

$$9.62\frac{1}{2}$$

$$\$2642.62\frac{1}{2} \div 522 = \$5.06\frac{1}{4}, \text{ Ans}$$

Ex. 34. $\$1.18\frac{1}{2}$ 1356

$\$.41$ 736

$1.12\frac{1}{2}$ 870

$.31$ 528

$$\$.06\frac{1}{4} \times 486 = \$30.37\frac{1}{2}; \quad \$.10 \times 208 = \$20.80;$$

$$\$30.37\frac{1}{2} + \$20.80 + \$13.62\frac{1}{2} = \$64.80, \text{ entire loss};$$

$$\$235.87\frac{1}{2} - \$64.80 = \$171.07\frac{1}{2}, \text{ gained, Ans}$$

Ex. 35. $\frac{1\frac{2}{3}}{7\frac{5}{8}} + \frac{1\frac{1}{2}}{7\frac{1}{4}} = \frac{7}{8}; \frac{7}{8} \div 2 = \frac{7}{16}, \text{ greater};$

$$\frac{1\frac{2}{3}}{7\frac{5}{8}} - \frac{1\frac{1}{2}}{7\frac{1}{4}} = \frac{6}{11}; \frac{6}{11} \div 2 = \frac{3}{11}, \text{ less.}$$

Ex. 36. $1 + \frac{4}{9} = \frac{13}{9}$ times his original capital, end of 1st year;

$$\frac{13}{9} \times \frac{4}{8} = \frac{13}{9} \quad \text{"} \quad \text{"} \quad \text{"} \quad \text{"} \quad \text{"} \quad \text{2d "}$$

$$\frac{13}{9} \times \frac{1}{8} = \frac{13}{72} \quad \text{"} \quad \text{"} \quad \text{"} \quad \text{"} \quad \text{"} \quad \text{3d "}$$

$$\$28585.70 \div \frac{13}{9} = \$17991, \text{ his original capital};$$

$$\$28585.70 - \$17991 = \$10594.70, \text{ gain, Ans.}$$

CONTINUED FRACTIONS.

(271, page 162.)

The division may be performed in the same manner as in finding the greatest common divisor. (See 150, Higher Arithmetic.)

(160—162)

Ex. 2.

		6721	1	
1240	5	6200	<i>Ans.</i> $\frac{1}{5+1}$	
1042	2	521	$\frac{2+1}{2+1}$	
198	2	396	$\frac{2+1}{2+1}$	
125	1	125	$\frac{1+1}{1+1}$	
78	1	78	$\frac{1+1}{1+1}$	
52	1	52	$\frac{1+1}{1+1}$	
21	2	42	$\frac{2+1}{2+1}$	
20	2	10	$\frac{2+1}{2+1}$	
1	10	10	$\frac{10}{10}$	

Ex. 3.

		516901	1	
223874	2	447748	<i>Ans.</i> $\frac{1}{2+1}$	
207459	3	69153	$\frac{3+1}{3+1}$	
16415	4	65660	$\frac{4+1}{4+1}$	
13972	4	3493	$\frac{4+1}{4+1}$	
2443	1	2443	$\frac{1+1}{1+1}$	
2100	2	1050	$\frac{2+1}{2+1}$	
343	3	1029	$\frac{3+1}{3+1}$	
336	16	21	$\frac{16+1}{16+1}$	
7	3	21	$\frac{3}{3}$	

Ex. 4.

29	4	121	1
25	5	116	<i>Ans.</i> $\frac{1}{4+1}$
4	1	5	$\frac{5+1}{1+1}$
4	4	1	$\frac{4}{4}$

(273, page 163.)

- Ex. 1.** Terms of continued fraction, $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}$;
approximate values, $\frac{1}{2}, \frac{3}{7}, \frac{1}{3}, \frac{67}{155}$, *Ans.*
- Ex. 2.** Terms of continued fraction, $\frac{1}{4}, \frac{1}{4}, \frac{1}{7}, \frac{1}{7}, \frac{1}{4}$;
approximate values, $\frac{1}{4}, \frac{4}{17}, \frac{6}{21}, \frac{39}{104}, \frac{53}{145}$, *Ans.*
- Ex. 3.** Terms of continued fraction, $\frac{1}{7}, \frac{1}{8}, \frac{1}{4}$;
approximate values, $\frac{1}{7}, \frac{5}{36}, \frac{21}{151}$, *Ans.*
- Ex. 4.** Terms of continued fraction, $\frac{1}{3}, \frac{1}{4}, \frac{1}{2}, \frac{1}{4}, \frac{1}{3}$;
approximate values, $\frac{1}{3}, \frac{4}{13}, \frac{2}{9}, \frac{10}{29}, \frac{12}{35}$, *Ans.*
- Ex. 5.** Terms of continued fraction, $\frac{1}{1}, \frac{1}{2}, \frac{1}{4}, \frac{1}{3}$;
approximate values, $1, \frac{2}{3}, \frac{9}{13}, \frac{29}{42}$, *Ans.*

COMPOUND NUMBERS

REDUCTION DESCENDING.

(367, page 194.)

- Ex. 2** £133 × 20 + 6 s. = 2666 s.;
2666 s. × 12 + 8 d. = 32000 d.;
32001 d. × 4 = 128000 far., *Ans.*

(162—194)

Ex. 3. $100 \text{ mi.} \times 63360 = 6336000 \text{ in.}$, *Ans.*

NOTE.—When the number given for reduction contains but one denomination, the scale of relation may be taken from the table of *Unit Equivalents*, and the answer obtained by a single operation.

Ex. 4. $1\frac{1}{2} \text{ mi.} \times 4 = 6 \text{ mi.}$, length of fence;
 $6 \text{ mi.} \times 320 = 1920 \text{ rd.}$, *Ans.*

Ex. 5. $8 \times 3 \times 3 = 72 \text{ cu. ft.}$, solid contents of the block;
 $175 \text{ lb.} \times 72 = 12600 \text{ lb.}$; $12600 \text{ lb.} \div 100 = 126 \text{ cwt.}$
 $126 \text{ cwt.} \div 20 = 6 \text{ T. } 6 \text{ cwt.}$, *Ans.*

Ex. 6. $1 \text{ hhd.} = 63 \text{ gal.}$; $\$.28 \times 63 = \$17.64$, *Ans.*

Ex. 7. $1548 \text{ bu. } 1 \text{ pk.} = 6193 \text{ pk.}$; $2 \text{ bu. } 3 \text{ pk.} = 11 \text{ pk.}$,
 $6193 \div 11 = 563$, *Ans.*

Ex. 8. $\$.375 \times 10 = \$37.50$; $10 \text{ bu.} = 640 \text{ pt.}$;
 $\$.06\frac{1}{4} \times 640 = \$40.00$; $\$.40 - \$37.50 = \$2.50$, *Ans.*

Ex. 9. $90^\circ \times 60 + 17' = 5417'$; $5417' \times 60 + 40''$
 $= 325060''$, *Ans.*

Ex. 10. The 18th century embraced the time from the commencement of A. D. 1701 to A. D. 1800 inclusive, and 1800 was not leap year; hence, $100 \text{ yr.} \times 365 + 24 \text{ da.} = 36524 \text{ da.}$, *Ans.*

Ex. 11. $1 \text{ great-gross} = 1728 \text{ units}$; $\$.06\frac{1}{4} \times 1728 = \$108$, *Ans.*

Ex. 12. $4 \text{ bales } 4 \text{ bundles } 1 \text{ ream } 10 \text{ quires} = 990 \text{ quires}$;
 $24 \div 8 = 3 \text{ vol. per quire}$; $990 \times 3 = 2970 \text{ vol.}$, *Ans.*

Ex. 13. $18 \text{ yr.} \times 365 + 24 \text{ da.} = 6594 \text{ da.}$;
 $6594 \text{ da.} \times 24 = 158256 \text{ h.}$;
 $158256 \text{ h.} \times 60 = 9495360 \text{ min.}$, *Ans.*

Ex. 14. $481 \text{ sov.} \times 240 = 115440 \text{ d.}$, *Ans.*

Ex. 15. $\$.7\frac{3}{8} = \$7.375$; $\$.7375 \times 1000 = 7375 \text{ mills}$, *Ans.*

Ex. 16. $3 \text{ P.} \times 130 = 390 \text{ gal.}$; $390 \text{ gal.} \times 4 = 1560 \text{ qt.}$, *Ans.*

- Ex. 17. 37 ells $\times 5 + 1$ qr. = 186 qr.;
 186 qr. $\div 4 = 46$ yd. 2 qr., *Ans.*
- Ex. 18. £6 10 s. 10 d. = 1570 d.;
 $\$.02\frac{1}{80} \times 1570 = \$31.66\frac{1}{2}$, *Ans.*
- Ex. 19. 6 O. $\times 16 + 14$ f 3 = 110 f 3;
 $110 \text{ f } 3 \times 8 + 3 \text{ f } 3 = 883 \text{ f } 3$;
 $883 \text{ f } 3 \times 60 + 45 \text{ m} = 53025 \text{ m}$, *Ans.*
- Ex. 20. 1 T. 1 P. 1 hhd. = 7 hhd.;
 $7 \text{ hhd.} \times 52\frac{1}{2} = 367\frac{1}{2}$ gal., *Ans.*
- Ex. 21. £126 12 s. 6 d. = 30390 d.;
 $30390 \text{ d.} \div 60 = \$506\frac{1}{2}$, *Ans.*
- Ex. 22. 1 hhd. = 504 pt.; 2 qt. + 1 qt. + 1 pt. = 7 pt.;
 $504 \div 7 = 72$, *Ans.*
- Ex. 23. 2 ft. 9 in. = 33 in.; $63360 \div 33 = 1920$ steps in 1
 mile; $1920 \times 95 = 182400$, *Ans.*
- Ex. 24. $\$1\frac{3}{4} \times 12 = \$21$, cost; 12 bbl. $\times 126 = 1512$ qt.;
 $\$.06 \times 1512 = \$90.72$; $\$90.72 - \$21 = \$69.72$, *Ans.*
- Ex. 25. 75 A. $\times 10 + 4$ sq. ch. = 754 sq. ch.;
 $754 \text{ sq. ch.} \times 16 + 18 \text{ P.} = 12082 \text{ P.}$;
 $12082 \text{ P.} \times 625 + 118 \text{ sq. l.} = 7551368 \text{ sq. l.}$, *Ans.*
- Ex. 26. 4 in. $\times 16 = 64$ in., *Ans.*
- Ex. 27. 150 leagues $\times 3 \times 1.15 = 517.5$ miles, *Ans.*
- Ex. 28. $(50 \text{ A.} - 14 \text{ A.}) \times 160 = 5760 \text{ sq. rd.}$, *Ans.*
- Ex. 29. 36 lb. 8 oz. = 8800 pwt.;
 $\$1.042 \times 8800 = \$9169.60$, *Ans.*
- Ex. 30. 9 cwt. 42 lb. = 942 lb.;
 $942 \text{ lb.} \times 8 = 7536 \text{ lb.}$; $7536 \div 48 = 157$, *Ans.*
- Ex. 31. $\$1\frac{1}{4} \times 12 = \$15$, cost; 12 bbl. $\times 280 = 3360 \text{ lb.}$;
 $\$.0075 \times 3360 = \$25.20$;
 $\$25.20 - \$15 = \$10.20$, *Ans.*

- Ex. 32.** 1 lb. 10 $\bar{3}$ = 22 $\bar{3}$ = 10560 gr. = 1056 doses;
 $\$2.25 \times 22 = \$49.50$; $\$.12\frac{1}{2} \times 1056 = \$132$;
 $\$132 - \$49.50 = \$82.50$, *Ans.*

(368, page 196.)

- Ex. 1.** $3\frac{1}{10}$ lb. $\times \frac{1}{1} \times \frac{2}{1} = \frac{4}{5}$ pwt., *Ans.*
Ex. 2. $3\frac{1}{2}$ hhd. $\times \frac{6}{1} \times \frac{4}{1} \times \frac{2}{1} = \frac{3}{1}$ pt., *Ans.*
Ex. 3. $21\frac{1}{12}$ mi. $\times \frac{8}{1} \times \frac{4}{1} \times \frac{1}{2} = \frac{5}{8}$ yd., *Ans.*
Ex. 4. $3\frac{1}{2}$ gal. $\times \frac{1}{1} \times \frac{2}{1} \times \frac{1}{4} = \frac{1}{8}$ gi., *Ans.*
Ex. 5. $5000 \times \frac{2}{3} \times \frac{3}{4} \times \frac{6}{11} \times \frac{2}{7}$ lb. $\times \frac{1}{16} = 4\frac{1}{8}$ oz., *Ans.*
Ex. 6. $\$18000 \times \frac{100}{1000} = \$1800$, *Ans.*
Ex. 7. $\frac{1}{4}$ P. $\times \frac{2}{1} = \frac{1}{2}$ l., *Ans.*
Ex. 8. $\frac{1}{8}$ D. $\times \frac{2}{1} = \frac{1}{4}$ gr., *Ans.*
Ex. 9. $\frac{1}{2} \times \frac{1}{1} \text{ rd.} \times \frac{1}{2} = \frac{1}{4}$ yd., *Ans.*
Ex. 10. $\frac{1}{18} \text{ wk.} \times \frac{7}{1} \times \frac{2}{3} = 8\frac{1}{3}$ da., *Ans.*
Ex. 11. $1380 \times \frac{1}{4} \times \frac{7}{1} \text{ A.} \times \frac{160}{1} = \frac{3}{8}$ sq. rd., *Ans.*

(369, page 197.)

- Ex. 1.** $\frac{2}{10} \text{ yd.} \times 3 = 2\frac{7}{10} \text{ ft.}$; $\frac{7}{10} \text{ ft.} \times 12 = 8\frac{2}{5} \text{ in.}$,
Ans. 2 ft. $8\frac{2}{5}$ in.
Ex. 2. $\frac{1}{3} \text{ mo.} \times 30 = 24 \text{ da.}$, *Ans.*
Ex. 3. $8\frac{1}{10} \text{ T.} \times 20 = 18\frac{3}{5} \text{ cwt.}$; $3\frac{1}{2} \text{ cwt.} \times 100 = 96\frac{1}{2} \text{ h.}$,
 $\frac{7}{8} \text{ lb} \times 16 = 14 \text{ oz.}$; *Ans.* 18 cwt. 96 lb. $1\frac{1}{2}$ oz.
Ex. 4. $\frac{5}{8} \text{ T.} \times 20 = 11\frac{1}{2} \text{ cwt.}$; $\frac{1}{8} \text{ cwt} \times 4 = \frac{1}{2} \text{ qr.}$;
 $\frac{1}{2} \text{ qr.} \times 28 = 12\frac{1}{2} \text{ lb.}$; $\frac{1}{3} \text{ lb.} \times 16 = 7\frac{1}{3} \text{ oz.}$;
Ans. 11 cwt. 12 lb. $7\frac{1}{3}$ oz.
Ex. 5. $\frac{3}{8} \times \frac{1}{2} \text{ lb.} \times 12 = 11\frac{1}{4} \bar{3}$; $\frac{1}{4} \bar{3} \times 8 = 2 \bar{3}$;
Ans. 11 $\frac{3}{4}$ 2 g

(195—197)

Ex. 6. $\frac{7}{18}$ A. $\times 160 = 86\frac{1}{10}$ P.;
 $\frac{1}{80}$ P. $\times 30\frac{1}{4} \times 9 = 31\frac{3}{8}$ sq. ft.;
 $1\frac{3}{8}$ sq. ft. $\times 144 = 58\frac{1}{2}$ sq. in.;
Ans. 86 P. 3 sq. ft. $58\frac{1}{2}$ sq. in.

Ex. 7. $\frac{3}{4}$ mi. $\times 320 = 137\frac{1}{4}$ rd.;
 $\frac{1}{4}$ rd. $\times 16\frac{1}{2} = 2\frac{2}{7}$ ft.; $\frac{2}{7}$ ft. $\times 12 = 4\frac{2}{7}$ in.;
Ans. 137 rd. 2 ft. $4\frac{2}{7}$ in.

Ex. 8. $\frac{4}{9}$ great-gross $\times 12 = 6\frac{2}{3}$ gross;
 $\frac{2}{3}$ gross $\times 12 = 10\frac{2}{3}$ doz.; $\frac{3}{4}$ doz. $\times 12 = 3\frac{3}{4}$ units;
Ans. 6 gross 10 doz. $3\frac{3}{4}$ units.

Ex. 9. $\frac{1}{16}$ great circle $\times 360 \times 60 = 12150$ mi., *Ans.*

Ex. 10. $\frac{2}{3}$ Cd. $\times \frac{4}{5} = 2\frac{7}{10}$ Cd.; $\frac{7}{10}$ Cd. $\times 8 = 5\frac{6}{10}$ cd. ft.;
 $\frac{6}{10}$ cd. ft. $\times 16 = 9\frac{3}{5}$ cu. ft.;
Ans. 2 Cd. 5 cd. ft. $9\frac{3}{5}$ cu. ft.

Ex. 11. 438 mi. $\times \frac{3}{8} = 262\frac{1}{4}$ mi.; $\frac{4}{5}$ mi. $\times 320 = 256$ rd.;
Ans. 262 mi. 256 rd.

Ex. 12. $4\frac{1}{2}$ f 3 $\times 8 = 3\frac{7}{12}$ f 3; $\frac{7}{12}$ f 3 $\times 60 = 35$ m;
Ans. 3 f 3 35 m

Ex. 13. $\frac{3}{4}$ S. $\times 30 = 12\frac{3}{4}^\circ$; $\frac{5}{7}^\circ \times 60 = 51\frac{3}{7}'$; $\frac{3}{7}' \times 60 = 25\frac{5}{7}''$;
Ans. $12^\circ 51' 25\frac{5}{7}''$

Ex. 14. $\frac{7}{13}$ hhd. $\times 63 = 33\frac{1}{3}$ gal.; $\frac{1}{3}$ gal. $\times 4 = 3\frac{2}{3}$ qt.;
 $\frac{2}{3}$ qt. $\times 2 = 1\frac{5}{3}$ pt.; $\frac{5}{3}$ pt. $\times 4 = 1\frac{7}{3}$ gi.;
Ans. 33 gal. 3 qt. 1 pt. $1\frac{7}{3}$ gi.

(370, page 198.)

Ex 1. $.645$ da. $\times 24 = 15.48$ h.; $.48$ h. $\times 60 = 28.8$ min.;
 $.8$ min. $\times 60 = 48$ sec.; *Ans.* 15 h. 28 min. 48 sec

Ex 2 $.765$ lb. $\times 12 = 9.18$ oz.; $.18$ oz. $\times 20 = 3.6$ pwt.;
 $.6$ pwt $\times 24 = 14.4$ gr. *Ans.* 9 oz. 3 pwt. 14.4 gr

(197, 198)

Ex. 3. $.6625 \text{ mi.} \times 320 = 212 \text{ rods};$

Ans. 212 rd.

Ex. 4. $.8469^\circ \times 60 = 50.814'; .814' \times 60 = 48.84'';$

Ans. $50' 48.84''.$

Ex. 5. $.875 \text{ hhd.} \times 63 = 55.125 \text{ gal.}; .125 \text{ gal.} \times 8 = 1 \text{ pt.};$

Ans. 55 gal. 1 pt.

Ex. 6. $\pounds.85251 \times 20 = 17.0502 \text{ s.}; .0502 \text{ s.} \times 12 = .6024 \text{ d.};$
 $.6024 \text{ d.} \times 4 = 2.4096 \text{ far.};$ *Ans.* 17 s. 2.4 + far.

Ex. 7. $.715^\circ \times 60 = 42.9'; .9' \times 60 = 54'';$ *Ans.* $42' 54''.$

Ex. 8. $7.88125 \text{ A.} \times 160 = 141 \text{ P.};$

Ans. 7 A. 141 P.

Ex. 9. $.625 \text{ fath.} \times 6 = 3.75 \text{ ft.} = 3\frac{3}{4} \text{ ft.},$ *Ans.*

Ex. 10. $.375625 \text{ bbl.} \times 200 = 75.125 \text{ lb.}; .125 \text{ lb.} \times 16 = 2 \text{ oz.},$

Ans. 75 lb. 2 oz.

Ex. 11. $.1150390625 \text{ Cong.} \times 8 = .9203125 \text{ O.};$

$.9203125 \text{ O.} \times 16 = 14.725 \text{ f}\frac{3}{4}; .725 \text{ f}\frac{3}{4} \times 8 = 5.8 \text{ f}\frac{3}{4},$
 $8 \text{ f}\frac{3}{4} \times 60 = 48 \text{ m.};$ *Ans.* $14 \text{ f}\frac{3}{4} 5 \text{ f}\frac{3}{4} 48 \text{ m.}.$

Ex. 12. $.61 \text{ tun} \times 2 = 1.22 \text{ P.}; .22 \text{ P.} \times 2 = .44 \text{ hhd.};$

$.44 \text{ hhd.} \times 63 = 27.72 \text{ gal.}; .72 \text{ gal.} \times 4 = 2.88 \text{ qt.};$

$.88 \text{ qt.} \times 2 = 1.76 \text{ pt.}; .76 \text{ pt.} \times 4 = 3.04 \text{ gi.};$

Ans. 1 P. 27 gal. 2 qt. 1 pt. 3.04 gi.

REDUCTION ASCENDING.

(371, page 200.)

Ex. 1. $1913551 \text{ oz.} \div 16 = 119596 \text{ lb. } 15 \text{ oz.}; 119596 \text{ lb.}$
 $\div 100 = 1195 \text{ cwt. } 96 \text{ lb.}; 1195 \text{ cwt.} \div 20 = 59 \text{ T.}$
 $15 \text{ cwt.};$ *Ans.* 159 T. 15 cwt. 96 lb. 15 oz.

(198—200)

- Ex. 2. $97920 \text{ gr.} \div 20 = 4896 \text{ sc.}$; $4896 \text{ sc.} \div 3 = 1632 \text{ dr.}$
 $1632 \text{ dr.} \div 8 = 204 \text{ oz.}$;
 $204 \text{ oz.} \div 12 = 17 \text{ lb.}$, *Ans.*
- Ex. 3. $1000000 \text{ in.} \div 12 = 83333 \text{ ft.}$ 4 in.;
 $83333 \text{ ft.} \div 3 = 27777 \text{ yd.}$ 2 ft.;
 $27777 \text{ yd.} \div 5\frac{1}{2} = 5050 \text{ rd.}$ 2 yd.;
 $5050 \text{ rd.} \div 320 = 15 \text{ mi.}$ 250 rd.;
Ans. 15 mi. 250 rd. 2 yd. 2 ft. 4 in.
- Ex. 4. $120 \times 56 = 6720 \text{ sq. rd.}$;
 $6720 \text{ sq. rd.} \div 160 = 42 \text{ A.}$, *Ans.*
- Ex. 5. $60 \times 15 \times 10 = 9000 \text{ cu. ft.}$;
 $9000 \text{ cu. ft.} \div 16 = 562 \text{ cd. ft.}$ 8 cu. ft.;
 $562 \text{ cd. ft.} \div 8 = 70 \text{ Cd.}$ 2 cd. ft.;
Ans. 70 Cd. 2 cd. ft. 8 cu. ft.
- Ex. 6. 28 ft. 6 in. $= 342 \text{ in.}$; $6 \text{ ft.} = 72 \text{ in.}$;
 $342 \div 72 = 4\frac{3}{4} \text{ fath.}$, *Ans.* Or,
 28 ft. 6 in. $= 28\frac{1}{2} \text{ ft.}$; $28\frac{1}{2} \div 6 = 4\frac{3}{4} \text{ fath.}$, *Ans.*
- Ex. 7. $30876 \text{ gi.} \div 4 = 7719 \text{ pt.}$;
 $7719 \text{ pt.} \div 2 = 3859 \text{ qt.}$ 1 pt.;
 $3859 \text{ qt.} \div 4 = 964 \text{ gal.}$ 3 qt.;
 $964 \text{ gal.} \div 63 = 15 \text{ hhd.}$ 19 gal.;
Ans. 15 hhd. 19 gal 3 qt. 1 pt
- Ex. 8. $27072 \text{ qt.} \div 8 = 3384 \text{ pk.}$; $3384 \text{ pk.} \div 4 = 846 \text{ bu.}$, *Ans*
- Ex. 9. $254 \div 2 = 127 \text{ gi.}$; $127 \text{ gi.} \div 4 = 31 \text{ pt.}$ 3 gi.;
 $31 \text{ pt.} \div 2 = 15 \text{ qt.}$ 1 pt.; $15 \text{ qt.} \div 4 = 3 \text{ gal.}$ 3 qt.;
Ans. 3 gal. 3 qt. 1 pt. 3 gi
- Ex. 10. $1234567 \text{ far.} \div 4 = 308641 \text{ d.}$ 3 far.;
 $308641 \text{ d.} \div 12 = 25720 \text{ s.}$ 1 d.;
 $25720 \text{ s.} \div 20 = \text{£}1286$; *Ans.* £1286 1 d. 3 far.
- Ex. 11 One half crown $= 2 \text{ s.}$ 6 d. $= 30 \text{ d.}$;
 $2468 \div 30 = 82\frac{4}{5}$ half crowns, *Ans*
 (200)

Ex. 12. $\$88,350 \div \$186 = 475$ francs, *Ans.*

Ex. 13. $622080 \text{ cu. in.} \div 1728 = 360 \text{ cu. ft.};$

$360 \text{ cu. ft.} \div 40 = 9 \text{ T.}, \text{ } Ans.$

Ex. 14. $84621 \text{ m} \div 60 = 1410 \text{ f } 3 \text{ } 21 \text{ m}; 1410 \text{ f } 3 \div 8 =$

$176 \text{ f } 3 \text{ } 2 \text{ f } 3; 176 \text{ f } 3 \div 16 = 11 \text{ O.}; 11 \text{ O.} \div 8 = 1$

$\text{Cong. } 3 \text{ O.}; \quad Ans. 1 \text{ Cong. } 3 \text{ O. } 2 \text{ f } 3 \text{ } 21 \text{ m}.$

Ex. 15. $135000000 \div 1728 = 78125$ great-gross, *Ans.*

Ex. 16. $1020300'' \div 60 = 17005'; 17005' \div 60 = 283^\circ 25';$

$283^\circ \div 30 = 9 \text{ S. } 13^\circ; \quad Ans. 9 \text{ S. } 13^\circ 25'$

Ex. 17. $411405 \text{ sec.} \div 60 = 6856 \text{ min. } 45 \text{ sec.}; 6856 \text{ min.} \div$

$60 = 114 \text{ h. } 16 \text{ min.}; 114 \text{ h.} \div 24 = 4 \text{ da. } 18 \text{ h.};$

Ans. 4 da. 18 h. 16 min. 45 sec.

Ex. 18. $412' \div 60 = 6^\circ 52', \text{ } Ans.$

Ex. 19. $360^\circ \times 60 = 21600'; 21600' \times 20 = 432000 \text{ min. of}$

$\text{time}; 432000 \text{ min.} \div 60 = 7200 \text{ h.}; 7200 \text{ h.} \div 24$

$300 \text{ da.}, \text{ } Ans.$

Ex. 20. $120 \times 144 = 17280; 17280 \div 20 = 864, \text{ } Ans.$

Ex. 21. $180^\circ \times 69.16 = 12448.8 \text{ mi.}, \text{ } Ans.$

Ex. 22. $45 \text{ min.} + 25 \text{ min.} = 70 \text{ min. gained each day};$

$36 \text{ yr.} \times 365 + 9 \text{ da.} = 13149 \text{ da.};$

$13149 \text{ da.} \times 70 = 920430 \text{ min.};$

$920430 \text{ min.} \div 60 = 15340 \text{ h. } 30 \text{ min.};$

$15340 \text{ h.} \div 24 = 639 \text{ da. } 4 \text{ h.};$

Ans. 639 da. 4 h. 30 min.

Ex. 23. $20 \times 4 = 80 \text{ qt. bought.};$

$20 \times 282 = 5640 \text{ cu. in.}; 5640 \div 57\frac{3}{4} = 97\frac{5}{7} \text{ qt. sold}$

$97\frac{5}{7} \text{ qt.} - 80 \text{ qt.} = 17\frac{5}{7} \text{ qt. gained, } Ans.$

Ex. 24. $1500 \text{ bu.} \times 35 = 52500 \text{ lb.};$

$52500 \text{ lb.} \div 28 = 1875 \text{ bu.}, \text{ } Ans.$

Ex. 25. $120 \text{ lea.} \times 3 \times 1.152\frac{2}{3} = 414.96 \text{ mi.}, \text{ } Ans.$

(200, 201)

- Ex 26.** 1 bbl. 1 gal. 2 qt.=33 gal.;
 $33 \text{ gal.} \times 231 = 7623 \text{ cu. in.};$
 $7623 \text{ cu. in.} \div 282 = 27\frac{3}{4} \text{ beer gal., Ans.}$
- Ex. 27** $150 \text{ bu.} \times 2150.4 = 322560 \text{ cu. in.};$
 $322560 \div 2218.2 = 145.415 + \text{ Imp. bushels, Ans.}$
- Ex. 28.** $68 \text{ ft. } 8 \text{ in.} = 68\frac{2}{3} \text{ ft.}; 68\frac{2}{3} \times 33 = 2266 \text{ sq. ft.};$
 $2266 \text{ sq. ft.} \div 100 = 22\frac{2}{3} \text{ squares, Ans.}$
- Ex 29.** $4 \text{ ft.} = 48 \text{ in.}; 3 \text{ ft.} = 36 \text{ in.}; 1 \text{ ft. } 6 \text{ in.} = 18 \text{ in.};$
 $48 \times 36 \times 18 = 31104 \text{ cu. in., Ans.}$
- Ex. 30.** $120 \times 56 = 6720 \text{ P.}; 6720 \text{ P.} \div 160 = 42 \text{ A., Ans.}$
- Ex. 31.** $356 \text{ dr.} \times 3 \times 20 = 21360 \text{ gr.};$
 $21360 \text{ gr.} \div 24 = 890 \text{ pwt.}; 890 \text{ pwt.} \div 20 = 44 \text{ oz. } 10$
 $\text{pwt.}; 44 \text{ oz.} \div 12 = 3 \text{ lb. } 8 \text{ oz.};$
Ans. 3 lb. 8 oz. 10 pwt.
- Ex. 32.** $175 \text{ T.} \times 2240 = 392000 \text{ lb.}; 392000 \div 2000 = 196 \text{ T.,}$
short ton weight; $\$3.75 \times 175 = \$656.25, \text{ cost};$
 $\$4.50 \times 196 = \$882, \text{ sold for};$
 $\$882 - \$656.25 = \$225.75 \text{ gain, Ans.}$
- Ex. 33.** $73750 \div 1.25 = 59000 \text{ sq. ft.};$
 $59000 \text{ sq. ft.} \div 272\frac{1}{4} = 216 \text{ P. } 194 \text{ sq. ft.}; 216 \text{ P.}$
 $\div 160 = 1 \text{ A. } 56 \text{ P.}; \text{ Ans. } 1 \text{ A. } 56 \text{ P. } 194 \text{ sq. ft.}$
- Ex 34.** $2492 \text{ lb.} \div 56 = 44.5 \text{ bushels of corn};$
 $2175 \text{ lb.} \div 60 = 36.25 \text{ bushels of wheat};$
 $\$.60 \times 44.5 = \$26.70; \$.120 \times 36.25 = \$43.50;$
 $\$26.70 + \$43.50 = \$70.20, \text{ Ans.}$
- Ex 39.**
$$\begin{array}{r} 72 \overline{) 75} \\ \underline{42} \\ 4 \overline{) 175} \end{array}$$

 $\$43.75, \text{ Ans.}$
- Ex. 40.**
$$\begin{array}{r} 90 \overline{) 5} \\ \underline{6} \\ 3 \overline{) 76} \end{array}$$

Ans. \\$25.33\frac{1}{3}

$$\begin{array}{r|l} \text{Ex. 41.} & 2 \\ & 126 \\ 21 & 2 \\ \hline & 24 \text{ lb., Ans.} \end{array}$$

$$\begin{aligned} \text{Ex. 42. } & \frac{64 \times 70}{72} = \$52.50, \text{ rated at in} \\ & \text{Vermont;} \\ & \$52.50 + \$7.50 = \$60, \text{ to be} \\ & \text{sold for in New Jersey;} \\ & \frac{60 \times 90}{64} = 100 \text{ d.} = 8 \text{ s. 4 d. Ans} \end{aligned}$$

(372, page 203.)

$$\text{Ex. 1. } \frac{2}{3} \text{ s.} \times \frac{1}{20} = \frac{1}{10} \text{, Ans.}$$

$$\text{Ex. 2. } \frac{5}{7} \text{ pwt.} \times \frac{1}{21} \times \frac{1}{12} = \frac{1}{336} \text{ lb., Ans.}$$

$$\text{Ex. 3. } \frac{1}{2} \text{ lb.} \times \frac{1}{2000} = \frac{1}{4000} \text{ T., Ans.}$$

$$\text{Ex. 4. } \frac{1}{3} \times \frac{20}{1} \text{ sec.} \times \frac{1}{60} \times \frac{1}{60} = \frac{1}{180} \text{ h., Ans.}$$

$$\begin{aligned} \text{Ex. 5. } & \frac{2}{3} \text{ pt.} \times \frac{1}{2} \times \frac{1}{4} \times \frac{1}{8} = \frac{1}{96} \text{ hhd;} \\ & \frac{1}{880} \text{ hhd.} - \frac{1}{840} \text{ hhd.} = \frac{1}{770} \text{ hhd., Ans.} \end{aligned}$$

$$\text{Ex. 6. } \frac{224}{1} \times \frac{1}{3} \times \frac{2}{7} \text{ pt.} \times \frac{1}{2} \times \frac{1}{8} = \frac{1}{3} \text{ pk.} = \frac{2}{3} \text{ of 2 pk., Ans}$$

$$\text{Ex. 7. } \frac{2}{3} \times \frac{1}{4} \times \frac{9}{14} \text{ cd. ft.} \times \frac{1}{8} = \frac{3}{98} \text{ Cd., Ans.}$$

$$\text{Ex. 8. } \frac{3}{19} \times \frac{4}{17} \times \frac{19}{2} \text{ P.} \times \frac{1}{160} = \frac{3}{1360} \text{ A., Ans.}$$

$$\text{Ex. 9. } \frac{3}{4} \times \frac{220}{1} \times \frac{2}{1} \times \frac{12}{1} \times \frac{1}{320} = 12\frac{3}{8} \text{ mi., Ans.}$$

$$\text{Ex. 10. } \frac{3}{4} \times \frac{4}{1} \times \frac{121}{1} \text{ cu. ft.} \times \frac{1}{96} = \frac{11}{2} \text{ Pch., Ans.}$$

$$\text{Ex. 11. } \frac{15}{2} \times \frac{2}{1} \times \frac{12}{4} \text{ cu. ft.} \times \frac{1}{128} = \frac{15}{64} \text{ Cd., Ans.}$$

$$\text{Ex. 12. } \frac{4}{1} \times \frac{1}{12} \times \frac{1}{3} = \frac{1}{9} \text{ yd., Ans.}$$

(373, page 205.)

$$\text{Ex. 1. } 100 \text{ P.; } 1 \text{ A.} = 160 \text{ P.;}$$

$$\frac{100}{160} \text{ A.} = \frac{5}{8} \text{ A., Ans.}$$

$$\text{Ex. 2. } 146 \text{ rd. } 3 \text{ yd. } 2 \text{ ft.} = 4400 \text{ ft.; } 1 \text{ mi.} = 5280 \text{ ft.};$$

$$\text{Ex. 3. } 18 \text{ s. } 5 \text{ d. } 2\frac{2}{3} \text{ far.} = \frac{11520}{13} \text{ far.; } \frac{1}{13} = 960 \text{ d.;}$$

$$\frac{11520}{13} \times \frac{1}{960} = \frac{128}{13} \text{, Ans.}$$

(203-205)

Ex. 4. $7\frac{3}{4} 7\frac{3}{4} 2\frac{9}{10} 14 \text{ gr.} = 3834 \text{ gr.}; 21 \text{ lb.} = 120600 \text{ gr.},$
 $\frac{3834}{120600} = \frac{71}{2400}, \text{ Ans.}$

Ex. 5. $4 \text{ da. } 16 \text{ h. } 30 \text{ min.} = 6750 \text{ min.}; 3 \text{ wk.} = 30240 \text{ min.};$
 $\frac{6750}{30240} = \frac{5}{112}, \text{ Ans.}$

Ex. 6. $\frac{1\frac{1}{2}}{4} \text{ bu.} = \frac{7}{8} \text{ bu.}, \text{ Ans.}$

Ex. 7. $28 \text{ gal. } 2 \text{ qt.} = 114 \text{ qt.}; 1 \text{ hhd.} = 252 \text{ qt.};$
 $252 \text{ qt.} - 114 \text{ qt.} = 138 \text{ qt.}; \frac{138}{252} = \frac{23}{42}, \text{ Ans.}$

Ex. 8. $4 \text{ bundles } 6 \text{ quires } 16 \text{ sheets} = 4000 \text{ sheets};$
 $1 \text{ bale} = 4800 \text{ sheets}; \frac{4000}{4800} \text{ bales} = \frac{5}{6} \text{ of a bale, Ans}$

Ex. 9. $\frac{4800}{54 \times 128} = \frac{5}{8}, \text{ Ans.}$

Ex. 10. $\frac{\$7\frac{1}{4}}{1\frac{1}{2}} = \$\frac{21}{11} \times \frac{77}{96} = \$6\frac{3}{16} = \$6.30, \text{ Ans.}$

Ex. 11. $3 \text{ O. } 3 \text{ f } \frac{3}{4} 1 \text{ f } \frac{3}{4} 36 \text{ m.} = 24576 \text{ m.};$
 $1 \text{ Cong.} = 61440 \text{ m.}; \frac{24576}{61440} \text{ Cong.} = \frac{2}{5} \text{ Cong., Ans}$

Ex. 12. $36 \text{ cu. ft. } 864 \text{ cu. in.} = 63072 \text{ cu. in.};$
 $1 \text{ T.} = 50 \text{ cu. ft.} = 86400 \text{ cu. in.};$
 $\frac{63072}{86400} = \frac{7}{10} \text{ T., Ans.}$

(374, page 206.)

Ex 1.	60	48.0 sec.
	60	46.80 min.
	24	9.78 h.
	7	5.4075 da.

Ans. .7725 wk.

Ex. 2	60	46.44'
	60	27.774
	80	3.4629°
Ans.		.14543 S

(205, 206)

Ex. 3. $160 \mid 51.52 \text{ P.}$ <i>Ans.</i> .322 A.	Ex. 4. $24 \mid 19.2 \text{ gr}$ $20 \mid 16.8 \text{ pwt.}$ $4 \mid 2.84 \text{ oz.}$ <i>Ans.</i> .71
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Ex. 5. $12 \mid 11.04 \text{ in.}$ $3 \mid 1.92 \text{ ft.}$ $5.5 \mid 2.64 \text{ yd.}$ $320 \mid 28.48 \text{ rd.}$ <i>Ans.</i> .089 mi.	Ex. 6. $3.25 \frac{2}{3} \div 12 = .2708\dot{3} \text{ lb.}$ Ex. 7. $16 \mid 12.00 \text{ P.}$ $10 \mid 4.75 \text{ sq. ch.}$ $23040 \mid 126.475 \text{ A.}$ <i>Ans.</i> .0054893 + Tp.
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Ex. 8. $3.75 \text{ ft.} \div 6 = .625 \text{ fath., } \textit{Ans.}$

Ex. 9. $.45 \text{ pk.} \div 4 = .1125 \text{ bu.; } .1125 \div 1.25 = .09, \textit{Ans.}$

Ex. 10. $3 \text{ A. } 80 \text{ P.} = 560 \text{ P.; } 51.52 \text{ P.;}$
 $51.52 + 560 = .092, \textit{Ans.}$

Ex. 11. $\frac{2}{3} \times \frac{1}{2} \times \frac{1}{4} \times \frac{1}{2000} = .001625, \textit{Ans.}$

Ex. 12. $60 \mid 36.00 \text{ m.}$ $8 \mid 5.6 \text{ f } 3$ <i>Ans</i> .7 f $\frac{2}{3}$	Ex. 13. $2 \mid 1.0 \text{ pt.}$ $4 \mid 3.5 \text{ qt.}$ $252 \mid 50.875 \text{ gal.}$ <i>Ans.</i> .20188 + T
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ADDITION.

(377, page 208.)

Ex. 3. *Ans.* 3 mi. 2 fur. 27 rd. 16 ft.

Ex. 4. *Ans.* 1016 A. 26 P. 15 sq. yd. 5 sq. ft. 72 sq. in.

Ex. 7. *Ans.* 15 Cd. 4 cd. ft. 8 cu. ft.

(206-208)

Ex. 8. $1\frac{1}{2}$ hhd. = 1 hhd. 42 gal.
 42 gal. 3 qt. $1\frac{1}{4}$ pt. = 42 " 3 qt. 1 pt. 1 gi.
 $\frac{7}{8}$ gal. = 3 " 1 "
 2 qt. $\frac{3}{4}$ pt. = 2 " 0 " 3 "
 1.75 pt. = 1 " 3 "

Ans. 2 hhd. 23 gal. 2 qt. 0 pt. 3 gi

Ex. 9. $145\frac{7}{8}$ A. = 145 A. 140 P.
 7 " $109\frac{1}{8}$ "
 1 " $136\frac{1}{8}$ "
 $\frac{7}{8}$ A. = $133\frac{1}{8}$ "

156 A. $39\frac{1}{8}$ P., *Ans.*

Ex. 10. 31 bu. 2 pk.
 $10\frac{7}{8}$ bu. = 10 " 3 " 4 qt.
 5 bu. $6\frac{1}{2}$ qt. = 5 " 0 " 6 " 1 pt.
 14 bu. 2.75 pk. = 14 " 2 " 6 "
 $\frac{2}{3}$ pk. = 5 " $\frac{2}{3}$ "

 62 bu. 1 pk. 5 qt. $1\frac{2}{3}$ pt., *Ans.*

Ex. 11. 42 yr. $7\frac{1}{2}$ mo. = 42 yr. 7 mo. 15 da.
 10 yr. 3 wk. 5 da. = 10 " 0 " 26 "
 $9\frac{3}{4}$ mo. = 9 " 22 " 12 h.
 1 wk. 16 h. 40 min. = 7 " 16 " 40 min
 $\frac{5}{8}$ mo. = 25 "
 $3\frac{1}{2}$ da. = 3 " 19 " 12 min.

Ans. 53 yr. 7 mo. 9 da. 23 h. 52 min.

Ex. 13. $1\frac{1}{2}$ gross $7\frac{1}{2}$ doz. = 304
 8 " $1\frac{1}{2}$ " = 453
 $\frac{3}{4}$ great-gross = 1296
 $6\frac{1}{4}$ doz. = 75
 4 doz. 7 units = 55

2183, *Ans.*
(208, 209)

$$\begin{array}{rcll}
 \text{Ex. 15.} & 3\frac{1}{2} \text{ Pch. 18 cu. ft.} & = & 4 \text{ Pch. 1 cu. ft. 864 cu. in} \\
 & 84.6 \text{ cu. ft.} & = & 3 \text{ " 10 " 604.8 "} \\
 & \frac{5}{8} \text{ Pch.} & = & 20 \text{ " 1080 "} \\
 & 2\frac{1}{4} \text{ cu. ft.} & = & 1280 \text{ "}
 \end{array}$$

Ans. 8 Pch. 9 cu. ft. 804.8 cu in

$$\begin{array}{r}
 \text{Ex. 16.} \quad \$ 3.75 \\
 \quad 25.50 \\
 \quad 12.875 \\
 \quad 2.40 \\
 \quad 2.5475 \\
 \hline
 \$17.0725, \text{ Ans.}
 \end{array}$$

$$\begin{array}{rcll}
 \text{Ex. 18.} & 42.4 & \text{bu.} \\
 & 2866 \text{ lb.} & = & 49.414- \text{ "} \\
 & 36\frac{1}{2} \text{ bu.} & = & 36.75 \text{ "} \\
 & 89 \text{ bu. 29 lb.} & = & 39.5 \text{ "} \\
 & & & \hline
 & \$.60 \times 168.063 & = & \$100.84-, \text{ Ans.}
 \end{array}$$

$$\begin{array}{rcll}
 \text{Ex. 19.} & 1.125 \text{ T.} \\
 & 1\frac{1}{2} \text{ T.} & = & 1.4 \text{ "} \\
 & 2500 \text{ lbs.} & = & 1.25 \text{ "} \\
 & & & \hline
 & \$8 \times 3.775 & = & \$30.20, \text{ Ans.}
 \end{array}$$

$$\begin{array}{rcll}
 \text{Ex. 20} & 140\frac{1}{2} \text{ cu. yd.} & = & 140.8 \text{ cu. yd} \\
 & & & 24.875 \text{ "} \\
 & 46 \text{ cu. yd. } 20\frac{1}{2} \text{ cu. ft.} & = & 46.75 \text{ "} \\
 & & & \hline
 & & & 212.425 \text{ cu. yd removes} \\
 & \$.18 \times 212.425 & = & \$38.24-, \text{ cost}
 \end{array}$$

SUBTRACTION.

(379, page 211.)

Ex. 3 *Ans.* 2 hhd. 54 gal. $1\frac{1}{2}$ qt.

Ex. 4.

15 yr 1 mo. 3 wk. 0 da. $17\frac{1}{2}$ h.=45 yr. 1 mo. 21 da. 17.5 h.

10 " 9 " 1 " 22 " 6.8 " =10 " 9 " 29 " 6.8 h.

Ans. 34 yr. 3 mo. 22 da. 10.7 hEx. 6. *Ans.* 12 cwt. 85 lb. 6 oz.Ex. 7. 2 wk. $3\frac{1}{2}$ da.=2 wk. 3 da. 20 h..659 wk. = 4 " 14 " 42 min. $43\frac{1}{2}$ sec.*Ans.* 1 wk. 6 da. 5 h. 17 min. $16\frac{1}{2}$ sec.Ex. 8. $41\frac{1}{4}$ hhd.=32.90625 gal.

.90625 "

Ans. 32 gal.,Ex. 9. $\frac{3}{4}$ of $3\frac{1}{2}$ A.=1 A. 60 P.

132.56 "

87.44 P., *Ans.*

Ex. 10. 10 lb. 8 oz. 8 pwt.

 $\frac{1}{4}$ lb.= 18 "10 lb. 7 oz. 10 pwt., *Ans*

Ex. 11. 36 Cd. 4 cd. ft.

10 " 6 " 12 cu. ft.

25 Cd. 5 cd. ft. 4 cu. ft., *Ans.*Ex. 12 $5\frac{1}{2}$ bbl =5 bbl. 15 gal. 3 qt. $\frac{1}{4}$ hhd.=1 " 4 " 2 "4 bbl. 11 gal. 1 qt., *Ans*

(211)

Ex. 13. $\frac{2}{3}$ wk.=4 da. 16 h.

$\frac{227}{80}$ da.= 15 " 10 min. 30 sec.

4 da. 0 h. 49 min. 30 sec., *Ans*

Ex. 14. $\frac{1}{5}$ gross= $7\frac{1}{2}$ doz.;

$7\frac{1}{2}$ doz.— $\frac{2}{3}$ doz.= $6\frac{1}{2}$ doz., *Ans*

Ex. 15. $\frac{7}{8}$ mi.=248 rd. 4 yd. 2 ft. 8 in.

$\frac{21}{16}$ rd.= 5 " 0 " 9 "

247 rd. $4\frac{1}{2}$ yd. 1 ft. 11 in.;

Or, 247 rd. 5 yd. 0 ft. 5 in., *Ans*.

Ex. 17. $\frac{3}{4}$ pk.=6 qt.; .0625 bu.=2 qt.;

6 qt.—2 qt.=4 qt., *Ans*.

Ex. 18. $\frac{1}{5}$ of $365\frac{1}{4}$ da.=28 wk. 6 da. 22 h.

$\frac{2}{3}$ of $5\frac{1}{2}$ wk.= 4 " 1 " 4 "

33 wk. 1 da. 2 h.— $49\frac{1}{4}$ min.=

33 wk. 1 da. 1 h. $10\frac{3}{4}$ min., *Ans*

Ex. 19. $\frac{2}{3}$ of $3\frac{1}{2}$ mi. + $17\frac{1}{4}$ rd.=1 mi. 40 rd.;

1 mi. 40 rd.— $213\frac{1}{8}$ rd.= $106\frac{3}{8}$ rd., *Ans*.

Ex. 20. 15 bbl. 3.25 gal.=15 bbl. 3 gal. 1 qt.

14 " 24 " 3.54 "

$9\frac{1}{2}$ gal. 1.46 qt.;

Or, 9 gal. 3.46 qt., *Ans*

Ex. 21. 1457 lb.+1578 lb.+1420 lb.=4455 lb.

=92 bu. 39 lb.; 200 bu.—92 bu. 39 lb.

=107 bu. 9 lb., *Ans*.

Ex. 22 50 A. 136.4 P.

48 " 123.3 "

200 A.—99 A. 99.7 P.=100 A. 60.3 P.

=100.376875 A.; $\$35 \times 100.376875$

= $\$3513.19+$, *Ans*.

(211, 212)

Ex. 23. $58 \times 37 \times 6 = 12876$ cu. ft. $= 476$ cu. yd. 24 cu. ft.;
 476 cu. yd. 24 cu. ft.
 471 " 16 " 972 cu. in.

Ans. 5 cu. yd. 7 cu. ft. 756 cu. in.

Ex. 24. $\frac{4}{5}$ lb. $= 9$ oz. 12 pwt. $\frac{3}{8}$ oz. $= 12$ pwt.
 $4\frac{4}{5}$ oz. $= 4$ " 16 " 16 gr. $\frac{7}{8}$ pwt. $= 0$ " 21 gr.
 $31\frac{1}{2}$ pwt. $= 1$ " 11 " 8 gr.

 1 lb. 4 oz. 0 pwt. 0 gr.
 11 " 3 "

 1 lb. 3 oz. 9 pwt. 21 gr., *Ans.*

Ex. 25. $5\frac{7}{12}$ A. $= 5$ A. 93 P. $10\frac{1}{12}$ sq. yd.
 $\frac{3}{4}$ of $6\frac{1}{4}$ A. $= 4$ " 26 " $20\frac{1}{4}$ "
 30 "
 $\frac{3}{11}$ of $2\frac{2}{11}$ P. $= 18$ "

 9 A. 150 P. 18 sq. yd.
 4 " 25 P. 12 "

 5 A. 125 P. 6 sq. yd.

(380, page 213.)

Ex. 1. 1783 yr. 1 mo. 20 da. 1775 " 4 " 19 "	Ex. 2. 1782 yr. 2 mo. 22 da. 1620 " 12 " 22 "
<i>Ans.</i> 7 yr. 9 mo. 1 da.	111 yr. 2 mo., <i>Ans.</i>
Ex. 3. 1860 yr. 7 mo. 4 da. 1607 " 5 " 23 "	Ex. 4. 1861 yr. 6 mo 3 da. 1859 " 1 " 30 "
<i>Ans.</i> 253 yr. 1 mo. 11 da.	<i>Ans.</i> 2 yr. 4 mo. 3 da.

(212, 213)

Ex 6 From July 4, 1855, to July 4, 1860, is 366 da.
 $+365 \text{ da.} + 365 \text{ da.} + 365 \text{ da.} + 366 \text{ da.} = 1827 \text{ da.}$;
 From July 4, 1860, to Dec. 12, 1860, is 27 da.
 $+31 \text{ da.} + 30 \text{ da.} + 31 \text{ da.} + 30 \text{ da.} + 12 \text{ da.} = 161$
 da.; from 16 minutes past 10 o'clock A. M., to 22
 minutes before 8 o'clock P. M., is 9 h. 22 min.;
 hence $1827 \text{ da.} + 161 \text{ da.} + 9 \text{ h. 22 min.}$
 $= 1988 \text{ da. 9 h. 22 min., Ans.}$

Ex. 7. 1862 yr. 1 mo. 1 da. 4 h. 55 min. 24 sec.
 1860 " 4 " 21 " 12 " 40 " 25 "

1 yr. 8 mo. 9 da. 16 h. 14 min. 59 sec.

As the full year is a common year, and the full months
 commence with May, the 1 yr. 8 mo. 9 da. $= 365 \text{ da.} + 31 \text{ da.}$
 $+ 30 \text{ da.} + 31 \text{ da.} + 31 \text{ da.} + 30 \text{ da.} + 31 \text{ da.} + 30 \text{ da.} + 31 \text{ da.}$
 $+ 9 \text{ da.} = 619 \text{ da.}$; hence, 619 da. 16 h. 14 min. 59 sec., *Ans*

Ex. 8. $27 - 4 = 23$; $242 \text{ da.} + 23 \text{ da.} = 265 \text{ da., Ans.}$

MULTIPLICATION.

(382, page 215.)

Ex. 3. *Ans.* 44 A. 122 P. 9 sq. yd. 6 sq. ft.

Ex. 4. *Ans.* 131 Cd. 5 cd. ft. 12 cu. ft.

bu. pk. qt. pt.

Ex. 5. 34 3 6 1

2

69 3 5

7

489 1 3, *Ans.*

lb. oz. pwt.

Ex. 6. 4 10 18.7

9

44 2 8.3

3

132 7 4.9, *Ans*

(214, 215)

	lb.	$\frac{3}{4}$	3	3	gr.		gal.	qt.	pt.	gi.
Ex. 7.	9	3	2	13		Ex. 8.	5	2	1	3.25
				7						12
	5	8	3	0	11		68	2	1	3
				5						8
	27	7	7	2	15, Ans.		549	3		Ans.

	A.	P.	sq. yd.
Ex. 9.	78	135	15
			$15\frac{3}{4}$
	1182	112	$13\frac{1}{4}$ product by 15
	52	90	" " $\frac{3}{4}$
	1235	42	$23\frac{1}{4}$, Ans.

	cu. yd.	cu. ft.	cu. in.
Ex. 10.	9	10	1424
			8
	75	5	$102\frac{1}{4}$ product by 8;
			9
	676	23	576 product by $8 \times 9 = 72$
	9	10	" " 1
Ans.	686	7	272 " " 73

Ex. 11.	27 lb. 2 oz. 17 pwt 12 gr.,	product by 10
	163 " 5 " 5 " 0 " ,	" " $10 \times 6 = 60$
Subtract	2 " 8 " 13 " 18 " ,	" " 1
Ans.	160 lb. 8 oz. 11 pwt. 6 gr.,	" " $60 - 1 = 59$

Ex. 12.	22 yd. 0 ft. 11.5 in.,	product by 5
	111 " 1 " 9.5 " ,	" " $5 \times 5 = 25$
Ans.	557 " 2 " 11.5 " ,	" " $5 \times 5 \times 5 = 125$

Ex 13. 1 qt. 2 gi.= $1\frac{1}{4}$ qt.;

$$1\frac{1}{4} \text{ qt.} \times 144 = 180 \text{ qt.} = 45 \text{ gal., Ans}$$

Ex. 14. 5 Cong. 5 O. 15 f 3 2 f 3 30 m, prod. by 6

$$\text{Ans. } 22 \text{ " } 7 \text{ " } 13 \text{ " } 2 \text{ " } , \text{ " " } 6 \times 4 = 24$$

Ex. 15. 14 hhd. 46 gal. 1 qt. 0 pt. 2.4 gi., prod. by 4

$$58 \text{ " } 59 \text{ " } 1 \text{ " } 0 \text{ " } 1.6 \text{ " } , \text{ " " } 4 \times 4 = 16$$

$$3 \text{ " } 43 \text{ " } 0 \text{ " } 0 \text{ " } 2.6 \text{ " } , \text{ " " }$$

$$\text{Ans. } 62 \text{ hhd. } 39 \text{ gal. } 1 \text{ qt. } 1 \text{ pt. } .2 \text{ gi., " " } 16 \times 1 = 17$$

Ex. 16. 9 T. 13 cwt. 1 qr. 10.5 lb.=9.6671875 T.;

$$9.6671875 \text{ T.} \times 1.7 = 16.43421875 \text{ T.}$$

$$= 16 \text{ T. } 8 \text{ cwt. } 2 \text{ qr. } 20.65 \text{ lb., Ans.}$$

Ex. 17. 2 hhd. 28 gal. 2 qt. 1 pt.=2.375 hhd.;

$$2.375 \text{ hhd.} \times 4.8 = 11.4 \text{ hhd.}$$

$$= 11 \text{ hhd. } 25 \text{ gal. } 1 \text{ pt. } 2.4 \text{ gi., Ans.}$$

Ex. 18. 9 oz. 13 pwt. 8 gr. $\times 12$ =9 lb. 8 oz.= $9\frac{2}{3}$ lb., whole

$$\text{weight; } \$212.38 \times 9\frac{2}{3} = \$2053.00\frac{2}{3}, \text{ Ans.}$$

Ex. 19. 27 gal. 3 qt. 1 pt.=27.875 gal.;

$$27.875 \text{ gal.} \times 5 = 139.375 \text{ gal.};$$

$$\$1.375 \times 139.375 = \$191.64+, \text{ Ans.}$$

Ex. 20. 37 bu. 3 pk. 5 qt.=37.90625 bu.;

$$37.90625 \text{ bu.} \times 5 = 189.53+ \text{ bu.};$$

$$\$65 \times 189.53 = \$123.20--, \text{ Ans.}$$

DIVISION.

(383, page 218.)

Ex 6. Ans. 21 bu. 1 pk. 5 qt. 1 pt.

yd. ft. in.

Ex. 7. $3 \overline{) 336} \quad 4 \quad 3\frac{1}{3}$

(216—218)

$$\begin{array}{r} 7) 112 \quad 1 \quad 5\frac{1}{7} \\ \hline 16 \quad 0 \quad 2\frac{4}{7}, \text{ Ans.} \end{array}$$

Ex. 9. *Ans.* 10 cu. yd. 3 cu. ft. 428.15 cu. in.

	mi.	rd.	yd.	
Ex. 10. 9)	1986	140	1	
12)	220	228	5	
	18	125	4 $\frac{1}{2}$	Ans.

	sq. mi.	A.	P.
Ex. 11.	12	0	70
			2
45)	24	0	140
	341	564	Ans.

Ex. 12. Ans. 1 da. $12\frac{2}{3}$ h.

	cu. yd.	cu. ft.	cu. in.
Fr. 13. $33\frac{1}{2}=192$;	3794	20	$709\frac{1}{2}$
			3
100)	11384	7	400
	113	22	1300, Ans

Ex. 14 $13\frac{1}{2} = 13\frac{1}{2}$; lb 3 3 9 gr.
 121 8 2 1 4
 4

11) 485 1 1 1 16

5) 44 1 1 1 16

8 9 6 2 $3\frac{1}{2}$, Ans.

(218)

Ex. 15. $28^{\circ} 51' 27.765'' = 28.8577125^{\circ}$;
 $28.8577125^{\circ} \div 2.754 = 10.478472^{\circ}$;
 $10.478472^{\circ} = 10^{\circ} 28' 42\frac{1}{2}''$, *Ans.*

yd. ft. in.
 Ex. 16. $202 \text{ } 1 \text{ } 6\frac{1}{4}$
 5

3) $1012 \text{ } 1 \text{ } 9\frac{1}{4}$

$337 \text{ } 1 \text{ } 7\frac{1}{4}$, *Ans.*

da. h. min.
 Ex. 17. $10) 1950 \text{ } 15 \text{ } 15\frac{1}{2}$

$10) 195 \text{ } 1 \text{ } 31\frac{1}{2}$

Ans. $19 \text{ } 12 \text{ } 9\frac{1}{4}$

Ex. 18. $4 \text{ sq. mi.} \div 124 = 82 \text{ A. } 92\frac{2}{3}\frac{1}{4} \text{ P.}$, *Ans.*

Ex. 19. $48\frac{1}{2} \times 24 \times 6\frac{1}{2} = 7566 \text{ cu. ft.} = 280 \text{ cu. yd. } 6 \text{ cu. ft.}$;
 $48) 280 \text{ cu. yd. } 6 \text{ cu. ft.}$

$5 \text{ cu. yd. } 22 \text{ cu. ft. } 1080 \text{ cu. in.}$, *Ans.*

Ex. 20. $2 \text{ bu. } 3 \text{ pk. } 6 \text{ qt.} = 94 \text{ qt.}$; $356 \text{ bu. } 3 \text{ pk. } 5 \text{ qt.}$
 $= 11421 \text{ qt.}$; $11421 \div 94 = 121\frac{1}{2}$, *Ans.*

LONGITUDE AND TIME.

(385, page 219.)

Ex. 1 9 h

$8 \text{ " } 7 \text{ min. } 4 \text{ sec.}$

Ex. 2. $1 \text{ h. } 11 \text{ min. } 56 \text{ sec}$

15

$52 \text{ min. } 56 \text{ sec.}$

15

Take $17^{\circ} 59'$

From $89^{\circ} 2'$

$13^{\circ} 14' 0'' \text{ diff. lon.}$

$77^{\circ} 1'$

$71^{\circ} 3'$, *Ans.*

$90^{\circ} 15'$, *Ans.*

(218, 219)

Ex. 3. 9 h. 13 min. 20 sec. A. M., time at the easterly place,
2 h. 30 min. A. M., " " westerly "

6 h 43 min. 20 sec., difference of time;

6 h. 43 min. 20 sec. $\times 15 = 100^{\circ} 50'$, diff. lon.;

$100^{\circ} 50' - 18^{\circ} 28' = 82^{\circ} 22'$ west, *Ans.*

Ex. 4. 6 h. 8 min. 28 sec. $\times 15 = 92^{\circ} 7'$, *Ans.*

Ex. 5 1 h. 18 min. 16 sec. $\times 15 = 19^{\circ} 34'$;

$94^{\circ} 44' - 19^{\circ} 34' = 75^{\circ} 10'$ west, *Ans.*

Ex. 6. 2 h. 58 min. $23\frac{1}{2}$ sec. $\times 15 = 44^{\circ} 35' 50''$, diff. in lon.;

$77^{\circ} 51' + 44^{\circ} 35' 50'' = 122^{\circ} 26' 50''$ west, *Ans.*

Ex. 7. 2 h. 33 min. $53\frac{1}{2}$ sec. $\times 15 = 38^{\circ} 28' 29''$, diff. in lon.;

$71^{\circ} 12' 15'' + 38^{\circ} 28' 29''$

$= 109^{\circ} 40' 44''$ west, *Ans.*

Ex. 8. 5 h. 40 min. 20 sec. $\times 15 = 85^{\circ} 5'$ west, *Ans.*

Ex. 9. 12 h.—5 h. 51 min. $41\frac{2}{3}$ sec. $= 6$ h. 8 min. $18\frac{2}{3}$ sec.,

diff. time; 6 h. 8 min. $18\frac{2}{3}$ sec. $\times 15 = 92^{\circ} 4' 36''$,

diff. in lon.; $92^{\circ} 4' 36'' - 18^{\circ} 3' 30''$

$= 74^{\circ} 1' 6''$ west, *Ans.*

Ex. 10. 8 h. 53 min. 47 sec.

3.56 sec. $\times 24 =$ 1 " 25.44 "

Take 8 h. 52 min. 21.56 sec. { true time

From 10 " 4 " 36.80 " ship's time;

1 h. 12 min. 15.24 sec., diff. time;

1 h. 12 min. 15.24 sec. $\times 15 = 18^{\circ} 3' 48.6''$, *Ans.*

(386, page 221.)

Ex. 1. $84^{\circ} 24' - 77^{\circ} 1' = 7^{\circ} 23'$, diff. in longitude;

$7^{\circ} 23' \div 15 = 29$ min. 32 sec., diff. in time, *Ans.*

(220, 221)

Ex. 2. $113^{\circ} 14' - 2^{\circ} 20' = 110^{\circ} 54'$, diff. in longitude;
 $110^{\circ} 54' \div 15 = 7$ h. 23 min. 36 sec., *Ans.*

Ex. 3. $78^{\circ} 55' + 20^{\circ} 30' = 99^{\circ} 25'$, diff. in lon.;
 $99^{\circ} 25' \div 15 = 6$ h. 37 min. 40 sec., *Ans.*

Ex. 4. $74^{\circ} 1' - 63^{\circ} 36' = 10^{\circ} 25'$, diff. in lon.;
 $10^{\circ} 25' \div 15 = 41$ min. 40 sec., diff. in time;
 4 h. 30 min. P. M.—41 min. 40 sec.
 $= 3$ h. 48 min. 20 sec. P. M., *Ans.*

Ex. 5. $71^{\circ} 7' + 5' 2'' = 71^{\circ} 12' 2''$, diff. in lon.;
 $71^{\circ} 12' 2'' \div 15 = 4$ h. 44 min. $48\frac{2}{5}$ sec., diff. in
 time; 12 h. M.—4 h. 44 min. $48\frac{2}{5}$ sec.
 $= 7$ h. 15 min. $11\frac{3}{5}$ sec. A. M., *Ans.*

Ex. 6.
 $118^{\circ} + 120^{\circ} = 238^{\circ}$, diff. in lon. reckoned west from Pekin;
 $360^{\circ} - 238^{\circ} = 122^{\circ}$, “ “ “ “ “ Sacramento;
 $238^{\circ} \div 15 = 15$ h. 52 min., Sacramento earlier than Pekin; or
 $122^{\circ} \div 15 = 8$ h. 8 min. “ later “ “

Ex. 7. $35^{\circ} 32' + 76^{\circ} 37' = 112^{\circ} 9'$, diff. in lon.;
 $112^{\circ} 9' \div 15 = 7$ h. 28 min. 36 sec., diff. in time;
 6 h. 40 min. A. M.—7 h. 28 min. 36 sec.
 $= 2$ h. 8 min. 36 sec. P. M., *Ans.*

Ex. 8. 6 h. P. M.—7 h. 28 min. 36 sec.
 $= 10$ h. 31 min. 24 sec. A. M., *Ans.*

NOTE.—We always subtract the difference of time from the time at the easterly place to obtain the time at the westerly place, adding 12 h. to the minuend if necessary to make the subtraction possible; and we always add the difference of time to the time at the westerly place to obtain the time at the easterly place, rejecting 12 h. when the amount exceeds this time. And whenever 12 h. are borrowed in subtracting, or rejected in adding, the time changes from A. M. to P. M., or from P. M. to A. M.

- Ex 9. $94^{\circ} 46' 34'' - 72^{\circ} 35' 45'' = 22^{\circ} 10' 49''$, diff. in lon.
 $22^{\circ} 10' 49'' \div 15 = 1 \text{ h. } 28 \text{ min. } 43\frac{4}{5} \text{ sec.}$, diff. in
time; 6 h. 20 min. A. M.—1 h. 28 min. $43\frac{4}{5} \text{ sec}$
 $= 4 \text{ h. } 51 \text{ min. } 16\frac{1}{5} \text{ sec. A. M., Ans.}$
- Ex. 10. $28^{\circ} 49' + 93^{\circ} 5' = 121^{\circ} 54'$, diff. in lon.,
 $121^{\circ} 54' \div 15 = 8 \text{ h. } 7 \text{ min. } 36 \text{ sec.}$, diff. in time;
8 h. P. M.+8 h. 7 min. 36 sec.
 $= 11 \text{ h. } 7 \text{ min. } 36 \text{ sec. P. M., Ans.}$
- Ex. 11. 12 h. M.—8 h. 7 min. 36 sec.
 $= 3 \text{ h. } 52 \text{ min. } 24 \text{ sec. P. M., Ans.}$
- Ex. 12. $88^{\circ} 1' 29'' + 5' 2'' = 88^{\circ} 6' 31''$, diff. in lon.;
 $88^{\circ} 6' 31'' \div 15 = 5 \text{ h. } 52 \text{ min. } 26\frac{1}{5} \text{ sec.}$, diff in
time; 12 h. M.+5 h. 52 min. $26\frac{1}{5} \text{ sec.}$
 $= 5 \text{ h. } 52 \text{ min. } 26\frac{1}{5} \text{ P. M., Ans.}$

PROMISCUOUS EXAMPLES IN COMPOUND NUMBERS.

(Page 222.)

- Ex. 1. Ans. 55799 gr.
- Ex. 2. 3 cwt. 12 lb.=.156 T.; $\$15.50 \times .156 = \$2.418$, Ans.
- Ex. 3. 27 yd. 2 qr.=110 qr.; $110 \text{ qr.} \div 5 = 22 \text{ ells, Ans.}$
- Ex. 4. $\$18.945 \div \$4.84 = £3.914256$
 $= £3 \text{ } 18 \text{ s. } 3 \text{ d. } 1.6 + \text{qr., Ans.}$
- Ex. 5. Ans. 130413645 sec.
- Ex. 6. 24 sheets $\times 8 \times 2 = 384 \text{ pages, Ans.}$
- Ex. 7. 1 s. 6 d.=18 d.; $£5 \text{ } 6 \text{ s. } 6 \text{ d.} = 1278 \text{ d.}$;
 $1278 \div 18 = 71 \text{ yd., Ans.}$
- Ex. 8. Ans. 37173 l.
- Ex. 9. Ans. 111111 sq. yd.
- Ex. 10. 3 gal. 1 qt. 1 pt.=27 pt.; 3 hhd.=1512 pt.
 $1512 \text{ pt.} \div 27 \text{ pt.} = 56$, Ans.

Ex. 11 $2\frac{1}{2}$ T.=5000 lb.; $\$.095 \times 5000 = \$475$, sold for,
 $\$475 - \$375.75 = \$99.25$, *Ans.*

Ex. 12 3 lb. 9 oz.=900 pwt.; 1 oz. 5 pwt.=25 pwt.;
 $900 \div 25 = 36 = 3$ doz., *Ans.*

Ex. 13 4 gal. 3 qt.=152 gi.; 2 qt. 1 pt. 2 gi.=22 gi.;
 $\frac{22}{152} = \frac{1}{7}\frac{1}{8}$, *Ans.*

Ex. 14. $\frac{3}{4} \times \frac{1}{11}$ rd. $\times \frac{1}{2} = \frac{3}{22}$ yd., *Ans.*

Ex. 15. $26\frac{1}{2} \times 20 = 530$ sq. ft.=58 $\frac{1}{2}$ sq. yd.=58 $\frac{1}{2}$ yd., *Ans.*

Ex. 16. 15 T. 3 cwt. 3 qr. 24 lb. long ton weight=34044
 lb.=17.022 T. short ton weight; hence
 $\$140 \times 17.022 = \$2383.08$, sold for;
 $\$.06 \times 34044 = \$2042.64$, cost;

$\$340.44$ gained, *Ans.*

Ex. 17. $(40$ ft.+ $36\frac{1}{2}$ ft.) $\times 2 = 153$ ft., round the room,
 $153 \times 22\frac{1}{4} = 3404\frac{1}{4}$ sq. ft. in the walls;
 $36\frac{1}{2} \times 40 = 1460$ sq. ft. in the ceiling;
 $3404\frac{1}{4}$ sq. ft.+ 1460 sq. ft.— 1375 sq. ft.= $3489\frac{1}{4}$ sq
 ft. to be paid for, at $\frac{1}{8} = 2$ cents per sq. ft.;
 hence $3489\frac{1}{4} \times 2 = \$69.785$, *Ans.*

Ex. 18. 78 lb. 9 oz. $\times 23 = 18$ cwt. 6 lb. 15 oz., *Ans.*

Ex. 19 $33^\circ 2' + 30^\circ 41' = 63^\circ 43'$, *Ans.*

Ex. 20. 1 gross 4 doz.=16 doz.;
 16 doz. $\times 31 = 496$ doz., *Ans.*

Ex. 21. 4 sq. rd. 120 sq. ft. 84 sq. in. $\times 18$
 $= 79$ sq. rd. $264\frac{1}{4}$ sq. ft. 72 sq. in.;
 160 sq. rd.— 79 sq. rd. $262\frac{1}{4}$ sq. ft. 72 sq. in.
 $= 80$ sq. rd. 7 sq. ft. 72 sq. in., *Ans.*

Ex. 22 $\$12.025 \div \$13 = .925$ T.=1850 lb., *Ans.*

Ex. 23 1 pk. 4 qt.=.375 bu.; $\$.72 \div .375 = \$1.92$, *Ans.*

Ex. 24. 36244 lb. $\div 60 = 604\frac{1}{5}$ bu., *Ans.*

Ex 25. $32 \times 24 \times 6 = 4608$ cu. ft. $= 170\frac{2}{3}$ cu. yd.;
 $\$.20 \times 170\frac{2}{3} = \$34.13+$, *Ans.*

Ex. 26. $(32 \text{ ft.} + 24 \text{ ft.}) \times 2 = 112 \text{ ft., mason's girt;}$
 $112 \times 6 \times 1\frac{1}{2} = 1008$ cu. ft. $= 40\frac{8}{11}$ Pch.;
 $\$1.25 \times 40\frac{8}{11} = \$50.90\frac{1}{11}$, *Ans.*

Ex. 27. 1 mi. $= 5280$ ft.; 10 ft. 4 in. $= 10\frac{1}{3}$ ft.;
 $248 \times 4280 \times \frac{2}{3} = 126720$ times, hind wheels;
 $248 \times 4280 \times \frac{2}{3} = 84480$ " forward "

42240 times, *Ans.*

Ex. 28. $\$3.75 \times 15.22 = \$57.075$
 $4.25 \times 7.36 = 31.28$

 $\$88.355$ cost;
 $\$.045 \times 2258 = 101.61$ sold for;

 $\$13.255$, *Ans.*

Ex. 29. $\frac{5}{7}$ of 3 T. 10 cwt. $= 5000$ lb.
 $\frac{4}{13}$ of 7 T. 3 cwt. 26 lb. $= 4408$ lb.

592 lb., *Ans.*

Ex. 30. 16 lb. 5 oz. 10 pwt. 13 gr. Troy $= 94813$ gr;
 $94813 \text{ gr.} \div 7000 = 13.5447 +$ lb. Avoirdupois;
 $13.5447 +$ lb. $= 13$ lb. 8 oz. 11.4 + dr., *Ans.*

Ex. 31. 1 ft. 7.8 in. $= 1.65$ ft. $= .1$ rd., *Ans.*

Ex. 32. 9 in. $= \frac{3}{4}$ ft.; 6 in. $= \frac{1}{2}$ ft.;
 $\frac{3}{4} \times \frac{1}{2} \times \frac{3}{4} = 8$ ft., *Ans.*

Ex. 33. 16 in. $= \frac{4}{3}$ ft.; $7 \times \frac{4}{3} = 5\frac{1}{3}$ ft., *Ans.*

Ex. 34. $17280 \text{ cu. in.} \div 268\frac{2}{3} = 64\frac{2}{3}$ gallons, dry measure
 $17280 \text{ cu. in.} \div 282 = 61\frac{1}{3}$ " beer "

Difference $8\frac{2}{3}\frac{2}{3}$ gallons, *Ans*
(223, 224)

Ex. 35. $\frac{60}{1} \times \frac{1}{4} \times \frac{1\frac{1}{2}}{1} \text{ ft.} \times \frac{1}{20} = 2.275 \text{ tons, Ans.}$

Ex. 36. $\frac{7\frac{1}{2}}{3} \text{ bu.} = 3 \text{ pk. } 4\frac{1}{2} \text{ qt.}; \frac{5}{8} \times \frac{5}{3} \times \frac{1}{3} \text{ qt.} = 1\frac{1}{3} \text{ qt.};$
 $3 \text{ pk. } 4\frac{1}{2} \text{ qt.} + 1\frac{1}{3} \text{ qt.} = 3 \text{ pk. } 6\frac{1}{4} \text{ qt.};$
 $5 \text{ bu. } 3\frac{1}{3} \text{ qt.} - 3 \text{ pk. } 6\frac{1}{4} \text{ qt.}$
 $= 4 \text{ bu. } 5\frac{1}{3} \text{ qt.} = 16\frac{2}{3} \text{ pk.. Ans.}$

	sq. mi.	A.	P.	sq. yd.		mi.	A.	R.	P.	sq yd
Ex. 37.	5	250	120	0			456	3	14	25
				7						3 $\frac{1}{4}$
8)	37	475	40			2	90	2	4	14 $\frac{1}{2}$
	4	459	65				114	6	33	21 $\frac{3}{8}$
	2	204	118	5 $\frac{5}{8}$		2	204	2	38	5 $\frac{5}{8}$
	2	254	106	24 $\frac{5}{8}$, Ans.						

Ex. 38. $14.2878 \times 5.6 = 80.01168 \text{ lb.}$
 $= 80 \text{ lb. } 2 \text{ pwt. } 19.2768 \text{ gr., Ans.}$

Ex. 39. $\frac{4}{8} \text{ of } 24 = 15 \text{ carats fine, An}$

Ex. 40. $24 - 16 = 8 \text{ carats} = \frac{8}{24} = \frac{1}{3} \text{ alloy, Ans.}$

Ex. 41. $384\frac{1}{2} \text{ A.} = 384 \text{ A. } 128 \text{ P.}$
 $22 \text{ " } 60 \text{ "}$

2) $362 \text{ A. } 68 \text{ P. (See Prob. 33, p. 64.)}$

$181 \text{ A. } 34 \text{ P., younger;}$
 $203 \text{ " } 94 \text{ " elder.}$

Ex. 42. $4000 \text{ bu.} \times \frac{5\frac{2}{3}}{5\frac{2}{3}} = 3586\frac{2}{3} \text{ bu., Ans.}$

Ex. 43 $110 \text{ bu.} \times 64 = 7040 \text{ lb. clover seed exchanged;}$
 $7040 \text{ lb.} \div 60 = 117\frac{1}{3} \text{ bu. clover seed, N. Y. measure;}$
 $117\frac{1}{3} \times \frac{4}{1} \times \frac{3}{2} = 704 \text{ bu. corn received, N. Y. measure;}$
 $704 \times \frac{5.8}{1} \times \frac{1}{5.8} = 729\frac{1}{2} \text{ bu. corn, N. J. measure;}$

$$\begin{aligned} \$\frac{2}{3} \times 729\frac{1}{4} &= \$486\frac{2}{4}, \text{ corn brought in N. J.;} \\ \$4 \times 110 &= \$440, \text{ clover seed worth in N. J.;} \end{aligned}$$

 $\$ 46\frac{2}{4}$, the N. J. farmer gained;
 $110 \times \frac{4}{1} \times \frac{3}{2} = 660$ bu. corn, he would have received
had the standards of measure been the same;
hence $729\frac{1}{4}$ bu.—660 bu.= $69\frac{1}{4}$ bu. corn, gained by
the N. J. farmer in the reckoning.

Ex. 44 $763.4 \times 763.4 = 582779.56$ sq. ft.
 $= 13$ A. 60 P. 164.56 sq. ft., *Ans.*

Ex. 45. $20\frac{1}{2}$ ft. $\times 2 = 41$ ft., width of both sides;
 $42 \times 41 = 1722$ sq. ft. = 17.22 squares;
 $\$4.62\frac{1}{2} \times 17.22 = \$79.64\frac{1}{2}$, *Ans.*

Ex. 46. 17 T. 15 cwt. $62\frac{1}{2}$ lb. = 17.78125 T.;
 $\$1333.593 \div 17.78125 = \$75$, nearly, *Ans.*

Ex. 47.

4	4
8	15
231	5
	1728
77	14400

$187\frac{1}{7}$ gal., *Ans.*

Ex. 48.

96	300
	112
	\$350, <i>Ans</i>

Ex. 49.

72	300
	112
3	1400
	\$466 66\frac{2}{3}, <i>Ans.</i>

Ex. 50.

90	300
	112
3	1120
	\$373.33\frac{1}{3}, <i>Ans</i>

Ex 51

53	300
	112
	\$600, <i>Ans.</i>

Ex. 52.

60	300
	112
	\$560, <i>Ans</i>

Ex. 53. $\frac{1}{2} \times \$9\frac{1}{2} = \$5.777$

$\frac{1}{1} \times \frac{4}{2} = 7.50$

$\frac{3}{4} \times \frac{1}{2} = 2.177$

$\frac{1}{1} \times \frac{2}{2} = 1.125$

$\frac{2}{2} \times \frac{1}{2} = 1.0625$

$\frac{2}{4} \times \frac{4}{2} = 4.125$

\$21.76+, *Ans.*

Ex. 54. $(22 \times 130) \div 110 = 26$, *Ans.*

Ex. 55. $1000 \times \frac{1}{1728} \times \frac{2}{1} = 133\frac{1}{3}$ oz. = 8 lb. $5\frac{1}{3}$ oz., *Ans.*

Ex. 56. $\frac{4}{5} \times \frac{4}{5} \times \frac{1}{10} = 1\frac{1}{5} = 28\frac{1}{5}$, *Ans.*

Ex. 57. $\frac{2}{2} \times \frac{2}{2} \times \frac{6}{1} \times \frac{1728}{1} \times \frac{1}{21} \times \frac{1}{8}$
 $= 77\frac{2}{3} = 14\frac{2}{3}$ hhd., *Ans.*

Ex. 58. 18 ft. 9 in. = 225 in.; $225 \text{ in.} \times 3 = 675 \text{ in. per sec.}$;
 $150 \times \frac{6}{7} = 14080 \text{ sec.} = 3 \text{ h. } 54 \text{ min. } 40 \text{ sec.}$, *Ans*

Ex. 59. He had come from the East, because his watch showed later time;
 and 1 h. 6 min. 52 sec. $\times 15 = 16^\circ 43'$, *Ans.*

Ex. 60. $\frac{1}{2} \times \frac{1}{4} \times \frac{1}{4} \times \frac{1728}{1} \times \frac{10}{21504}$
 $= 1\frac{1}{2} = 108\frac{1}{2}$ bu., *Ans.*

Ex. 61. 3 hhd. 9 gal. 3 qt. = 198.75 wine gal.;
 $198.75 \times 231 = 45911.25 \text{ cu. in.}$;
 $45911.25 \div 277.274 = 165.5807 + \text{Imperial gal.}$, *Ans*

Ex. 62. $105.85 \text{ ch.} \times 40.15 \text{ ch.} = 4249.8775 \text{ sq. ch.}$
 $= 424.98775 \text{ A.}$, *Ans.*

Ex. 63. Since A has $\frac{7}{12}$ of the farm, B must own $\frac{5}{12}$; and
 $\frac{7}{12} - \frac{5}{12} = \frac{1}{6}$, the difference between their shares, which
 is 15 A. $68\frac{1}{2}$ P. Hence $15 \text{ A. } 68\frac{1}{2} \text{ P.} \times 6 = 92 \text{ A.}$
 91 P., whole farm; $92 \text{ A. } 91 \text{ P.} \div 12 = 7 \text{ A.}$
 $114\frac{1}{4} \text{ P.}$, $\frac{1}{12}$ of farm; $7 \text{ A. } 114\frac{1}{4} \text{ P.} \times 5 = 38 \text{ A.}$
 $91\frac{1}{4} \text{ P.}$, B's share, *Ans.*

Ex. 61. $41 \times 40 \times \frac{1}{160} = 16.40$ squares in both sides;
 $\$3.40 \times 16.40 = \$55.76$, *Ans.*

Ex. 65. $189.5 \times 150 = 28425$ sq. rd. $= 177.65625$ A.;
 $\$31.75 \times 177.65625 = \$5640.58+$, *Ans.*

Ex. 66. 9.75 tons $\times 50 = 487.5$ cu. ft.; and since every cubic foot will make 12 square feet of inch stuff,
 487.5 cu. ft. $\times 12 = 5850$ sq. ft. boards, *Ans.*

Ex. 67. $\frac{4}{1} \times \frac{7}{2} \times \frac{20}{7} \times \frac{1728}{1} \times \frac{1}{2} \times \frac{1}{3} = 23040 = 299\frac{1}{7}$ gal., *Ans.*

Ex. 68. $\frac{128}{1} \times \frac{1}{12} \times \frac{3}{7} = \frac{64}{7} = 9\frac{1}{7}$ ft., *Ans.*

Ex. 69. $\frac{32}{1} \times \frac{18}{1} \times \frac{25}{2} \times \frac{1}{80} \times \frac{1}{10} = 12$ min., *Ans.*

Ex. 70. Since the lots are to be *square*, the side of one must be a common measure of the two dimensions of the land. The greatest common divisor of $201\frac{3}{4}$ rods and $41\frac{1}{4}$ rods is $\frac{5}{2}$ rods, which is the length of one side of the required lots. Now, if we divide the piece of land, by running lines both crosswise and lengthwise, at a distance asunder of $\frac{5}{2}$ rods, we shall have $41\frac{1}{4} \div \frac{5}{2} = 9$ ranges of lots, and $201\frac{3}{4} \div \frac{5}{2} = 44$ lots in each range. Hence $44 \times 9 = 396$ lots, *Ans.*

Ex. 71. The quantity of land in each of the equal lots must be the greatest common divisor of the quantities in the several pieces. Hence,

4 A. 140 P. = 780 P.	4	780 .. 1092 .. 1560 .. 1872
6 " 132 " = 1092 "	3	195 .. 273 .. 390 .. 468
9 " 120 " = 1560 "	13	65 .. 91 .. 130 .. 156
11 " 112 " = 1872 "		5 .. 7 .. 10 .. 12
		$4 \times 3 \times 13 = 156$ P., <i>Ans.</i>

DUODECIMALS

ADDITION AND SUBTRACTION

(388, page 227.)

Ex. 4.	50 sq. yd.	1 sq. ft.	7'	4''
	62.	"	0	" 5' 8''
	48	"	2	
	42	"	2	" 8' 4''

202 sq. yd. 6 sq. ft. 3' 11'', area of the walls ;

800 sq. yd. 2 sq. ft. 5' , whole area ;

97 sq. yd. 5 sq. ft. 1' 1'', *Ans.*

MULTIPLICATION.

(390, page 228.)

Ex. 1	18 ft.	5'	Ex. 2.	23 ft.	7'
	16 ft.	8'		3 "	8'
	12	3' 4''		15	8' 8''
	294	8'		70	9'
	806 sq. ft.	11' 4'', <i>Ans.</i>		86 sq. ft.	5' 8''
				4 ft.	

345 cu. ft. 10' 8''=

2 Cd. 5 cd. ft. 9 cu. ft. 10' 8'', *Ans*

(227 228)

$$\begin{array}{r} \text{Ex. 3} \quad 79 \text{ ft.} \quad 8' \\ \quad \quad 38 \text{ " } \quad 11' \\ \hline \end{array}$$

$$\begin{array}{r} 8 \text{ sq. yd.} \quad 1 \text{ sq. ft.} \quad 0' \quad 4'' \\ 336 \text{ " } \quad 3 \quad 4' \\ \hline \end{array}$$

$$344 \text{ sq. yd.} \quad 4 \text{ sq. ft.} \quad 4' \quad 4'', \text{ Ans.}$$

$$\begin{array}{r} \text{Ex. 4.} \quad 7 \text{ ft.} \quad 6' \\ \quad \quad 3 \text{ " } \quad 8' \\ \hline \end{array}$$

$$\begin{array}{r} 1 \text{ sq. ft.} \quad 10' \quad 6'' \\ 22 \text{ " } \quad 6' \\ \hline \end{array}$$

$$\begin{array}{r} 24 \text{ sq. ft.} \quad 4' \quad 6'' \\ 1 \text{ ft.} \quad 10' \\ \hline \end{array}$$

$$\begin{array}{r} 20 \text{ cu. ft.} \quad 3' \quad 9'' \\ 24 \text{ " } \quad 4' \quad 6'' \\ \hline \end{array}$$

$$44 \text{ cu. ft.} \quad 8' \quad 3'', \text{ Ans}$$

$$\begin{array}{l} \text{Ex. 5.} \quad 56 \text{ ft.} \times 7 = 392 \text{ ft., entire length; } 392 \text{ ft.} \times 11' \times 10 \\ \quad \quad = 43120'' = 299 \text{ cu. ft.} \quad 5' \quad 4'', \text{ Ans.} \end{array}$$

$$\begin{array}{r} \text{Ex. 6.} \quad 60 \text{ ft.} \quad 6' \\ \quad \quad 40 \text{ " } \quad 8' \\ \hline \end{array}$$

$$\begin{array}{r} 100 \text{ ft.} \quad 9' \\ \quad \quad 2 \\ \hline \end{array}$$

$$\begin{array}{r} 201 \text{ ft.} \quad 6' \\ 22 \text{ " } \\ \hline \end{array}$$

$$\begin{array}{r} 4433 \text{ sq. ft.,} \quad \text{in walls;} \\ 2924 \text{ " } \quad 2' \quad \text{" roof;} \\ 523 \text{ " } \quad 8' \quad \text{" gables;} \\ \hline \end{array}$$

$$7880 \text{ sq. ft.} \quad 5', \text{ Ans.}$$

$$\begin{array}{r} 24 \text{ ft.} \quad 2' \\ \quad \quad 2 \\ \hline \end{array}$$

$$\begin{array}{r} 48 \text{ ft.} \quad 4' \\ 60 \text{ " } \quad 6' \\ \hline \end{array}$$

$$\begin{array}{r} 24 \text{ ft.} \quad 2' \\ 2895 \text{ " } \\ \hline \end{array}$$

$$2924 \text{ sq. ft.} \quad 2'$$

CONTRACTED METHOD.

(391, page 229.)

Ex. 1. 7 ft. 3' 4" 5'''
 6" 8' 5ft.

36	5'
4	10'
4	

41 ft. 7' ±, *Ans.*

Ex. 3. 6 ft. 2' 7"
 4" 3' 3 ft.

18	8'
1	7'
	2'

20 ft. 5' ±
6" 8' 2 ft.

40	10'
18	7'
	10'

55 cu. ft. 3' ±, *Ans.*

Ex. 2. 36 ft. 9' 4'
 9" 6" 26 ft

106	sq. yd. 2 ft. 3'
2	" 0 " 5'
	2 " 3'

Ans. 108 sq. yd. 4 ft. 11' ±

Ex. 4. 7 ft. 6' 8"
 11" 2' 3 ft.

22	8'
1	8'
	7'

24 ft. 6' ±
4" 8' 3 ft.

78	6'
16	4'
	8'

90 sq. ft. 4' ±, *Ans.*

(229, 230,

DIVISION.

(392, page 230.)

Ex. 1. 17 ft.) 287 ft. 7' (16 ft. 11', Ans

17

117

102

15 ft. 7'

15 " 7'

Ex. 2. 6 ft. 8') 29 ft. 5' 4" (4 ft. 5', Ans

26 " 8'

2 ft. 9' 4"

2 " 9' 4"

Ex. 3. 48 ft. 6') 1176 ft. 1' 6" (24 ft. 8', Ans

1164 "

12 ft. 1' 6"

12 " 1' 6"

Ex. 4.

88 ft. 10' 362 ft. 5' 4") 275 cu. yd. 5 cu. ft. 1' 4" =

9 ft. 4' 362 ft. 5' 4") 7430 cu. ft. 1' 4" (20 ft. 6', Ans

7248 cu. ft. 10' 8"

12 11' 4"

349 6'

181 cu. ft. 2' 8'

181 cu. ft. 2' 8"

362 ft. 5' 4"

'230, 231)

CONTRACTED METHOD.

(393, page 231.)

Ex. 1. 2 ft. 10' 7") 7 ft. 7' 3" (2 ft. 7' 8" $\pm$, Ans

5 " 9' 2"

1 ft. 10' 1"

1 ft. 8' 2"

1' 11"

1' 11"

Ex. 2.

7 ft. 2' 4" 88 ft. 5' 6") 64 ft. 9' 8" (1 ft. 11' 3" $\pm$, Ans

8''' 9'' 7' 4 ft.

88 " 5' 6"

28 9' 4"

31 ft. 4' 2"

4 2' 4"

80 " 8' 1"

5' 5"

8' 1"

5"

8' 4"

88 ft. 5' 6" $\pm$ Ex. 3. 7 ft. 2' 11") 86 ft. 4' 8" (5 ft. 3' 7''' $\pm$, Ans

86 ft. 2' 7"

2' 1"

1' 9"

4"

4"

(231)

SHORT METHODS.

FOR SUBTRACTION.

(395, page 232.)

Ex. 1. 1000

756

244, Ans

Ex. 3. 10.0000

.5768

9.4232, Ans.

Ex. 5. 64000.00000

90.59876

63909.40124, Ans.

Ex. 7. 1000

271

729;

100000

18365

81635;

10000000

3401250

6598750, Ans.

Ex. 2. 4000000

8576

3991424, Ans

Ex. 4. 1700000

13057

1686943, Ans

Ex. 6. 1000000

599948

400052, Ans

FOR MULTIPLICATION.

(396, page 233.)

Ex. 1. 78400

784

77616, Ans.

Ex. 3. 478300000

4783

478295217, Ans.

Ex. 2. 5873.000

5873

5867.127, Ans

Ex. 4. 75000.000

75

74999.925, Ans

(232, 233)

(397, page 233.)

Ex. 1. $\begin{array}{r} 78600 \\ 1572 \\ \hline \end{array}$

77028, *Ans.*

Ex. 2. $\begin{array}{r} 432700 \\ 17308 \\ \hline \end{array}$

415392, *Ans.*

Ex. 3. $\begin{array}{r} 7328000 \\ 21984 \\ \hline \end{array}$

7306016, *Ans.*

Ex. 4. $\begin{array}{r} 7873586000 \\ 89367930 \\ \hline \end{array}$

78342.18070, *Ans.*

Ex. 5. $\begin{array}{r} 437890000 \\ 262734 \\ \hline \end{array}$

437627266, *Ans.*

Ex. 6. $\begin{array}{r} 7077364000000 \\ 49541548 \\ \hline \end{array}$

7077314.458452, *Ans.*

(398, page 234.)

Ex. 1. $\begin{array}{r} 567 \times 13 \\ \hline \end{array}$

7371, *Ans.*

Ex. 2. $\begin{array}{r} 439603 \times 10.5 \\ \hline \end{array}$

4615831.5, *Ans.*

Ex. 3. $\begin{array}{r} 7859 \times 107 \\ \hline \end{array}$

840913, *Ans.*

Ex. 4. $\begin{array}{r} 18075 \times 1008 \\ \hline \end{array}$

18219600, *Ans.*

Ex. 5. $\begin{array}{r} 3907 \times 10.002 \\ \hline \end{array}$

39077.814, *Ans.*

(399, page 235.)

Ex. 1. $\begin{array}{r} 56783 \times 71 \\ \hline \end{array}$

4031593, *Ans.*

Ex. 2. $\begin{array}{r} 47.89 \times 60.1 \\ \hline \end{array}$

2878.189, *Ans.*

Ex. 3. $\begin{array}{r} 3724.5 \times .901 \\ \hline \end{array}$

3355.7745, *Ans.*

Ex. 4. $\begin{array}{r} 103078 \times 40001 \\ \hline \end{array}$

4123223078, *Ans.*

(233-235)

(400, page 236.)

Ex. 1	$ \begin{array}{r} 432711000 \\ 432711 \\ \hline 9)432278289 \\ \hline 48030921 \\ 2 \\ \hline 96061842, \text{ Ans.} \end{array} $	Ex. 2.	$ \begin{array}{r} 5780000 \\ 578 \\ \hline 9)5779422 \\ \hline 642158, \text{ Ans.} \end{array} $
Ex. 3	$ \begin{array}{r} 673200000 \\ 6732 \\ \hline 9)673193268 \\ \hline 74799252 \\ 8 \\ \hline 59.8894016, \text{ Ans.} \end{array} $	Ex. 4.	$ \begin{array}{r} 8675000 \\ 8675 \\ \hline 9)8666325 \\ \hline 962925 \\ 7 \\ \hline 674047.5, \text{ Ans.} \end{array} $
	Ex. 5. $ \begin{array}{r} 4444400000 \\ 44444 \\ \hline 9)4444355556 \\ \hline 493817284 \\ 8 \\ \hline 8950538272, \text{ Ans.} \end{array} $		

(401, page 237.)

Ex. 1. $24 \times 30 + 3^2 = 729, \text{ Ans.}$

Ex. 2. $48 \times 50 + 1^2 = 2401, \text{ Ans.}$

Ex. 3.

$28^2 = 26 \times 30 + 2^2 = 784$

$26^2 = 22 \times 30 + 4^2 = 676$

$39^2 = 38 \times 40 + 1^2 = 1521$

$38^2 = 36 \times 40 + 2^2 = 1444$

$87^2 = 34 \times 40 + 3^2 = 1369$

$36^2 = 32 \times 40 + 4^2 = 1296$

$35^2 = 30 \times 40 + 5^2 = 1225.$

(236, 237)

Ex. 4.

$$77^2 = 74 \times 80 + 3^2 = 5929; \quad 88^2 = 86 \times 90 + 2^2 = 7744;$$

$$8.6^2 = 8.2 \times 9.0 + .4^2 = 73.96;$$

$$99^2 = 98 \times 100 + 1^2 = 9801; \quad 98^2 = 96 \times 100 + 2^2 = 9604;$$

$$69^2 = 68 \times 70 + 1^2 = 4761; \quad 68^2 = 66 \times 70 + 2^2 = 4624;$$

$$6.7^2 = 6.4 \times 7.0 + .3^2 = 44.89; \quad 62^2 = 60 \times 64 + 2^2 = 3844.$$

(403, page 237.)

Ex. 1. $43700 \div 4 = 10925$, *Ans.*

Ex. 2. $68720 \div 4 = 17180$, *Ans.*

Ex. 3. $5734154000 \div 3 = 1911384666\frac{2}{3}$, *Ans.*

Ex. 4. $75864200 \div 8 = 9483025$, *Ans.*

Ex. 5. $78563000 \div 8 = 9820375$, *Ans.*

Ex. 6. $57687000 \div 7 = 8241000$, *Ans.*

(404, page 238.)

Ex. 1. $43789 \times 100 \times 8\frac{1}{4} = 36125925$, *Ans.*

Ex. 2. $58730 \times 1000 \times 7\frac{1}{8} = 418451250$, *Ans.*

Ex. 3. $7854 \times 31\frac{1}{4} = 268999.5$, *Ans.*

Ex. 4. $30724 \times 10000 \times 7\frac{1}{4} = 2253093333\frac{1}{4}$, *Ans.*

Ex. 5. $47836 \times 100 \times 7\frac{1}{8} = 34083150$, *Ans.*

Ex. 6. $53727 \times 100 \times 24\frac{1}{8} = 129840250$, *Ans.*

(405, page 239.)

Ex. 1. $\$568 \div 4 = \$142$, *Ans.*

$$\begin{aligned} \text{Ex. 2. } \$51 \div 6 &= \$8.50; \quad 33 \times 8 = 264 \text{ yd.}; \quad \$264 \div 16 = \\ &\$16.50; \quad \$18 \div 3 = \$6; \quad \$8.50 + \$16.50 = \$25; \\ &\$25 - \$6 = \$19, \text{ } \textit{Ans} \end{aligned}$$

Ex. 3. $\$28 \div 8 = \$3.50$, *Ans.*

Ex. 4. $\$576 \div 9 = \$64$, *Ans.*

$$\begin{aligned} \text{Ex. 5. } \$7.875 \div 63 &= \$.125 = \$\frac{1}{8}, \text{ gain on 1 gal.}; \\ \$576 \div 8 &= \$72, \text{ } \textit{Ans.} \end{aligned}$$

(237-239)

(406, page 241.)

Ex. 2. \$15.46

46

\$711.16, cost of 3 lb. 10 oz.=46 oz.;.773 " " 1 pwt.= $\frac{1}{20}$ of 1 oz.;

5.411 " " 7 "

.129 " " 4 gr.= $\frac{1}{4}$ of 1 pwt.;

.032 " " 1 "

.016 " " $\frac{1}{2}$ "

\$717.521, *Ans.*Ex. 3. 90 lb.=9 cwt.; $8.56 \times 9 = \$3.304$, *Ans.*

Ex. 4. \$4.48

3

\$13.44, cost of 3 bu.;1.12 " " 1 pk.= $\frac{1}{4}$ bu.;.14 " " 1 qt.= $\frac{1}{8}$ pk.;

28 " " 2 "

\$14.98, *Ans.*

Ex. 5. 8 lb. 5.42 oz.

5

41 lb. 11.1 oz., weight of 5 gal.;2 " 1.355 " " 1 qt.= $\frac{1}{4}$ gal.

4 " 2.71 " " 2 "

1 " 0.6775 " " 1 pt.= $\frac{1}{2}$ qt.4.1693 $\frac{3}{4}$ " " 1 gi.= $\frac{1}{4}$ pt.8.3387 $\frac{1}{2}$ " " 2 "

49 lb. 12.3506 $\frac{1}{4}$ oz.

(241)

Ex. 6. \$17.50
 3

\$52.50, cost of 3 A.;
 4.375, " " 1 R.;
 .517, " " 5 P= $\frac{1}{8}$ R.;
 8.282, " " 30 P.;
 .043, " " .4 P= $\frac{1}{25}$ R.;

\$60.747—, *Ans.*

Ex. 7 £3 17 s. 10.5 d.
 7

£27 5 s. 1.5 d., val. of 7 oz.;
 1 18 " 11.25 " " " 10 pwt= $\frac{1}{2}$ oz.;
 19 " 5.625 " " " 5 "
 3 " 10.725 " " " 1 "
 1 " 11.3625 " " " 12 gr.= $\frac{1}{2}$ pwt.;
 11.68125 " " " 6 " = $\frac{1}{2}$ of 12 gr.;

£30 10 s. 4.14375 d., *Ans.*

Ex. 8 4° 36' 40"
 5

23° 3' 20", in 5 da.;
 2° 18' 20", " 12 h.= $\frac{1}{2}$ da.;
 34' 35", " 3 "
 5' 45 $\frac{5}{8}$ ", " 30 min.= $\frac{1}{2}$ of 3 h.;
 23 $\frac{1}{18}$ ", " 2 "
 5 $\frac{5}{72}$ ", " 30 sec.= $\frac{1}{4}$ of 2 min.
 21 $\frac{137}{144}$ ", " 15 "
 11 $\frac{19}{216}$ ", " 10 "

26° 2' 34 $\frac{197}{144}$ ", *Ans.*

Ex. 9. 7 gal. 1 qt. 1 pt. 3 gi.=7.46875 gal.;

hence, \$7.46875, cost at 8 s.;

\$3.734875, " " 4 n.;

.622395 +, " " 8 d.;

\$4.35+, Ans.

Ex 10. \$12.50 , at 6 s. per day;

§ 2.083+, "1 s " "

\$10.416+, " 5 s. " "

.521—, " 3 d. " "

\$10.93+, Ans.

FOR DIVISION.

(407, page 242.)

Ex. 1 $634.75 \times 4 = 2539$, *Ans.*

Ex. 2. $785.6 \times 8 = 6284.8$, *Ans.*

Ex. 3. $5.16 \times 3 = 15.48$, *Ans.*

Ex. 4. $.167324 \times 8 = 1.338592$, *Ans.*

Ex. 5. $1748 \times 7 = 12236$, *Ans.*

Ex. 6. $57.634 \times 6 = 345.804$, *Ans*

(408, page 248.)

Ex. 1. 2575) 64375

4 4

103/00) 2575/00(25, Ann

206

515

515

(241-243,

$$\begin{array}{r}
 \text{Ex. 2.} \quad 3625 \) \ 76394 \\
 \underline{8} \qquad \underline{8} \\
 29/000 \) \ 611/152 \ (21\frac{2}{3}, \text{ Ans.} \\
 \underline{58} \\
 31 \\
 \underline{29} \\
 2152 + 8 = 2660
 \end{array}$$

$$\begin{array}{r}
 \text{Ex. 3.} \quad 433\frac{1}{3} \) \ 7325 \\
 \underline{3} \qquad \underline{3} \\
 13/00 \) \ 219/75 \ (16\frac{1}{3}, \text{ Ans.} \\
 \underline{13} \\
 89 \\
 \underline{78} \\
 1175 \times 4 = 47/00 \\
 1300 \times 4 = 52/00
 \end{array}$$

$$\begin{array}{r}
 \text{Ex. 4.} \quad 431.25 \) \ 5736 \\
 \underline{8} \qquad \underline{8} \\
 3450 \qquad 45888 \\
 \underline{2} \qquad \underline{2} \\
 69/00 \) \ 917/76 \ (18\frac{1}{3}, \text{ Ans.} \\
 \underline{69} \\
 227 \\
 \underline{207} \\
 2076 + 12 = 178
 \end{array}$$

(243)

116

Ex. 1. $\begin{array}{r} 3.14\frac{2}{7} \\ 7 \end{array} \bigg) \begin{array}{r} 785 \\ 7 \end{array}$

$\begin{array}{r} 22 \\ 4095 \end{array}$

$\underline{\hspace{1cm}}$

$249\frac{17}{33}, \text{ Ans.}$

(421, page 246.)

60

(243-246)

Ex. 9. 1 wk. 3 da. 12 h.=252 h.; 9 wk.=1512 h.;
 $1512 \div 252 = 6$, *Ans.*

Ex. 10. 10 A. 60 P.=1660 P.;
 6 A. 110 P.=1070 P.;
 $1070 \div 1660 = \frac{107}{166}$, *Ans.*

Ex. 11. 25 bu. 2 pk. 6 qt.=822 qt.;
 40 bu. 4.5 pk.=1316 qt.; $1316 \div 822 = 1\frac{2}{11}$, *Ans.*

Ex. 12. $18\frac{3}{4}^{\circ} = 67500''$; $45' 30'' = 2730''$;
 $\frac{27300}{67500} = \frac{22}{55}$, *Ans.*

Ex. 13. $\frac{\frac{3}{4} \times \frac{3}{4}}{\frac{1}{2}} \div \frac{12\frac{1}{2}}{\frac{1}{4}} = \frac{3}{4} \times \frac{3}{4} \times \frac{2}{1} \times \frac{4}{1} \times \frac{2}{25} = \frac{8}{125}$, *Ans.*

Ex. 14. $\frac{5}{8} \times \frac{3}{10} \times \frac{1}{4} \times \frac{1}{3} \times \frac{7}{8} \times \frac{2}{5} = \frac{139}{8400}$, *Ans.*

Ex. 15. $42 \div 28 = 1\frac{1}{2}$, *Ans.* (See 415.)

Ex. 16. 43 gal.=172 qt.; $\frac{3}{172}$, *Ans.*

Ex. 17. $15 \times \frac{4}{5} = 12$, *Ans.*

Ex. 18. $8\frac{1}{4} \div 7 = 1\frac{2}{28}$, *Ans.*

Ex. 19. $.75 \div (\frac{1}{2} \times \frac{8}{9}) = \frac{75}{100} \times \frac{2}{1} \times \frac{9}{8} = 2\frac{3}{8}$, *Ans.*

Ex. 20. $\$6.125 \div 25 = \$.245$, *Ans.*

Ex. 21. $\frac{3}{8} \times \frac{1}{8} = \frac{1}{16}$, *Ans.*

Ex. 22. 13 A 145 P. $\times \frac{4}{3} = 6$ A. 90 P., *Ans.*

PROPORTION.

(428, page 248.)

Ex. 1. $(?) = \frac{26 \times 10}{4} = 65$, *Ans.*

Ex. 2. $(?) = \frac{16 \text{ A.} \times 8865}{720} = 197 \text{ A.}$, *Ans.*
 (246-248)

$$\text{Ex. 3. } (?) = \frac{4\frac{1}{2} \text{ yd.} \times 29.25}{9.75} = 13\frac{1}{2} \text{ yd., Ans.}$$

$$\begin{aligned} \text{Ex. 4. } 21 \text{ A. } 140 \text{ P.} &= 3500 \text{ P.;} \\ (?) &= \frac{3500 \text{ P.} \times 1260}{750} = 5880 \text{ P.} = 36 \text{ A. } 120 \text{ P., Ans.} \end{aligned}$$

$$\text{Ex. 5. } (?) = \frac{10^6 \text{ oz.} \times 7.50 \times \frac{1}{18}}{18} = 21\frac{7}{8} \text{ oz., Ans.}$$

$$\begin{aligned} \text{Ex. 6. } £407 \text{ 2s. } 10\frac{3}{4} \text{d.} &= £407\frac{1}{4} = £285^0; \\ (?) &= 7 \text{ oz.} \times \frac{285^0}{7} \times \frac{1}{30} = 95 \text{ oz.} = 7 \text{ lb. } 11 \text{ oz., Ans.} \\ &\quad .15 \text{ hhd.} \times 2.89 \end{aligned}$$

$$\text{Ex. 7. } (?) = \frac{.3585}{.3585} = 1 \text{ hhd., Ans.}$$

$$\begin{aligned} \text{Ex. 8. } 1 \text{ T. } 7 \text{ cwt. } 3 \text{ qr. } 20 \text{ lb.} &= 3128 \text{ lb.;} \\ 13 \text{ T. } 5 \text{ cwt. } 2 \text{ qr.} &= 29736 \text{ lb.;} \\ (?) &= \frac{\$2.50 \times 29736}{3128} = \$70\frac{905}{1864}, \text{ Ans.} \end{aligned}$$

$$\text{Ex. 9. } (?) = \$175.35 \times \frac{3}{4} \times \frac{8}{9} = \$601.20, \text{ Ans.}$$

$$\begin{aligned} \text{Ex. 10. } \$12\frac{1}{2} &= \$2^5; 240\frac{1}{4} = 16^8; 149\frac{177}{1127} = 111\frac{99}{1127}; \\ (?) &= \$2^5 \times \frac{16^8}{7} \times \frac{1127}{188100} = \$20\frac{1}{8}, \text{ Ans.} \end{aligned}$$

$$\text{Ex. 11. } \frac{3}{8} \text{ yd.} \times \frac{520625}{10000} \times \frac{8}{7} = 40\frac{1}{2} \text{ yd., Ans.}$$

SIMPLE PROPORTION.

(436, page 252.)

$$\begin{aligned} \text{Ex. 1. } 12 \text{ gal. : } 63 \text{ gal.} &= \$30 : (?) \\ (?) &= \frac{\$30 \times 63}{12} = \$157.50, \text{ Ans.} \end{aligned}$$

$$\begin{aligned} \text{Ex. 2. } 9 \text{ bu. : } 100 \text{ bu.} &= 2 \text{ bar. : } (?) \\ 2 \text{ bar.} \times 100 & \\ (?) &= \frac{2 \times 100}{9} = 22\frac{2}{9} \text{ bar., Ans.} \end{aligned}$$

(248—252)

Ex. 3. \$26.75—\$22.25=\$4.50, gain on 18 bu.;

$$18 \text{ bu.} : 240 \text{ bu.} = \$4.50 : (?)$$

$$(?) = \$4.50 \times \frac{240}{18} = \$60, \text{ Ans.}$$

Ex. 4. $6\frac{1}{2}$ bu. : $9\frac{1}{4}$ = \$3 : (?)

$$(?) = \$3 \times \frac{37}{4} + \frac{3}{4} = \$4.269 +, \text{ Ans.}$$

Ex. 5. $1\frac{3}{4}$ yd. : $87\frac{1}{2}$ yd. = \$.42 : (?)

$$(?) = $.42 \times \frac{175}{2} \times \frac{4}{1} = \$21, \text{ Ans.}$$

Ex. 6. $\$1500 \times \frac{1000}{2775.40} = \$5446.62 +, \text{ Ans.}$

Ex. 7. $\frac{1}{3}$ of 15 da. = 12 da.; and since the number of men required will vary inversely as the time, 20 men $\times \frac{1}{12} = 25$ men required to perform the work in 12 days; 25 men—20 men = 5 men to be added.

Ex. 8. 100 yd. : 3.25 yd. = $\$473.07\frac{2}{3}$: (?)

$$\$6\frac{1}{3} \times \frac{1}{4} \times \frac{1}{100} = \$15.375, \text{ Ans.}$$

Ex. 9. 1 lb. 4 oz. 10 pwt. = 330 pwt.;

$$330 \text{ pwt.} : (?) = \$260.70 : \$39.50$$

$$330 \text{ pwt.} \times 260.70$$

$$(?) = \frac{\quad}{39.50} = 2 \text{ oz. 10 pwt., Ans.}$$

Ex. 10. 1 h. 14 min. $\times \frac{5}{4} = 2 \text{ h. 46 min. 30 sec., Ans.}$

Ex. 11. $\$1\frac{2}{3} : \$2\frac{7}{10} = \frac{4}{5} \text{ bu.} : (?)$;

$$(?) = \frac{4}{5} \text{ bu.} \times \frac{7}{10} \times \frac{5}{2} = \frac{7}{2} \text{ bu., Ans.}$$

Ex. 12. 46 A. 134 P. = 7494 P. ; 35 A. 90 P.

$$= 5690 \text{ P.} : \$374.70 \times \frac{5690}{7494} = \$284.50, \text{ Ans.}$$

Ex. 13. 1 yr. 3 mo. = 15 mo. ; 2 yr. 8 mo. = 32 mo. ;

$$\$1870.65 \times \frac{32}{15} = \$3990.72, \text{ Ans.}$$

Ex. 14. $164.5 \times \frac{7\frac{1}{2}}{5} = 246.75, \text{ Ans.}$

Ex. 15. 12 A. 156 P. = 2076 P. ;

$$2076 \text{ P.} \times \frac{132}{10} \times \frac{1}{17127} \text{ P.} = 107 \text{ A. 7 P., Ans.}$$

(252, 253)

Ex. 16. \$325 : \$2275 = \$26.32 : (?);

$$(\text{?}) = \frac{\$26.32 \times 2275}{325} = \$184.24, \text{ Ans.}$$

Ex. 17 $60.5 \times 44 = 2662$ sq. ft. = $295\frac{2}{3}$ sq. yd.;

$14\frac{1}{4}$ sq. yd. : $295\frac{2}{3}$ sq. yd. = $\$34\frac{1}{2}$: (?).

$$(\text{?}) = \$17\frac{1}{2} \times \frac{2662}{9} \times \frac{4}{57} = \$709.86\frac{2}{3}, \text{ Ans.}$$

Ex. 18. 1 doz. = 12; $10\frac{3}{4}$ gross = 1548;

$$\$0.625 \times 1548 = \$8.06\frac{1}{4}, \text{ Ans.}$$

Ex. 19. 7 s. 6 d. = $7\frac{1}{2}$ s. = $\frac{15}{2}$ s.; and since the weight of the loaf should vary inversely as the price of wheat, we

have $7\frac{1}{2}$ s. : 6 s. = (?): 9 oz.;

$$(\text{?}) = 9 \text{ oz.} \times \frac{15}{2} \times \frac{1}{6} = 11\frac{1}{4} \text{ oz., Ans.}$$

COMPOUND PROPORTION.

(439, page 256.)

$$\text{Ex. 1. } \begin{Bmatrix} 12 \\ 5 \end{Bmatrix} : \begin{Bmatrix} (?) \\ 18 \end{Bmatrix} = 11 : 33 \quad \begin{array}{c|c} (?) & 12 \\ 18 & 5 \\ 11 & 33 \\ \hline \end{array}$$

$$(\text{?}) = 10, \text{ Ans.}$$

$$\text{Ex. 2. } 40 \text{ da.} \times \frac{300}{450} \times \frac{24}{3} = 12\frac{1}{2} \text{ da., Ans.}$$

Ex. 3.

$$\begin{Bmatrix} 7 \\ 12 \end{Bmatrix} : \begin{Bmatrix} 16 \\ (?) \end{Bmatrix} = 1260 : 4728 \quad \begin{array}{c|c} 16 & 7 \\ (?) & 12 \\ 1260 & 4728 \\ \hline \end{array}$$

$$\begin{array}{c|c} 10 & 197 \\ \hline \end{array}$$

$$(\text{?}) = 19.7 \text{ da., Ans.}$$

$$\text{Ex. 4.} \quad \left\{ \begin{array}{l} 144 \\ 6 \\ 12 \end{array} \right. : \left\{ \begin{array}{l} 30 \\ (?) \\ 7 \end{array} \right. = \left\{ \begin{array}{l} 200 \\ 3 \\ 2 \end{array} \right. : \left\{ \begin{array}{l} 350 \\ 6 \\ 3 \end{array} \right.$$

$$(?) = \frac{144 \times 6 \times 12 \times 350 \times 6 \times 3}{30 \times 7 \times 200 \times 3 \times 2} = 259.2 \text{ da., Ans.}$$

$$\text{Ex. 5.} \quad 5 \text{ bu.} = 20 \text{ pk.; } 3 \text{ bu. } 3 \text{ pk.} = 15 \text{ pk.;}$$

$$22 \text{ da.} \times \frac{2}{3} \times \frac{2}{1} = 44 \text{ da., Ans.}$$

$$\text{Ex. 6.} \quad \left\{ \begin{array}{l} (?) \\ 10\frac{3}{4} \\ 1\frac{1}{2} \end{array} \right. : \left\{ \begin{array}{l} 3000 \\ 12\frac{3}{4} \\ 2\frac{1}{4} \end{array} \right. = 1 : 1$$

(?)	3000
82	3
8	38
8	2
4	11
(?) = 6531\frac{1}{4}, Ans.	

$$\text{Ex. 7.} \quad \left\{ \begin{array}{l} 300 \\ 1.25 \end{array} \right. : \left\{ \begin{array}{l} (?) \\ .90 \end{array} \right. = 1 : 3$$

(?)	300
.90	1.25
1	3
(?) = 1250 bu., Ans.	

$$\text{Ex. 8.} \quad 468 : (?) = \left\{ \begin{array}{l} 26 \\ 4 \end{array} \right. : \left\{ \begin{array}{l} 120 \\ 6 \end{array} \right.$$

$$(?) = \frac{468 \times 120 \times 6}{26 \times 4} = 3240, \text{ Ans.}$$

$$\text{Ex. 9.} \quad \left\{ \begin{array}{l} 17\frac{1}{2} \\ 10\frac{1}{2} \\ 13 \end{array} \right. : \left\{ \begin{array}{l} 16 \\ 7 \\ 15 \end{array} \right. = 546 : (?)$$

$$(?) = \frac{1}{2} \times \frac{1}{7} \times \frac{1}{15} \times \frac{546}{1} \text{ bbl.}$$

$$\times \frac{2}{3} \times \frac{2}{21} \times \frac{1}{13} = 38\frac{1}{3} \text{ bbl., Ans.}$$

$$\text{Ex. 10.} \quad 7 \text{ da.} \times \frac{1}{2} \times \frac{1}{4} \times \frac{1}{10} = 22 \text{ da., Ans.}$$

(256)

PROMISCUOUS EXAMPLES IN PROPORTION.

(Page 257.)

Ex 1. 7 ft. : 198 ft. = 4 ft. : (?)

$$(\text{?}) = \frac{4 \text{ ft.} \times 198}{7} = 113\frac{1}{7} \text{ ft., Ans.}$$

Ex. 2. \$972 : \$11\frac{1}{2} = \$607\frac{1}{2} : (?)

$$(\text{?}) = \frac{3}{4} \times \frac{1215}{2} \times \frac{1}{972} = \$7.08+, \text{ Ans.}$$

Ex. 3. 3 cwt. $\times \frac{660}{80} \times \frac{1}{4} = 99$ cwt., Ans.

Ex. 4. 18 da. $\times \frac{8}{10} = 14\frac{4}{5}$ da., Ans.

Ex. 5. $\left\{ \begin{array}{l} (\text{?}) \\ 16.50 \end{array} \right. : \left\{ \begin{array}{l} 140 \\ 24.75 \end{array} \right. = 1 : 1$

$$(\text{?}) = \frac{140 \text{ A.} \times 24.75}{16.50} = 210 \text{ A., Ans.}$$

Ex. 6. $\left\{ \begin{array}{l} 1728 \\ 18 \end{array} \right. : \left\{ \begin{array}{l} 750 \\ 54 \end{array} \right. = \$155.52 : (\text{?})$

$$(\text{?}) = \frac{\$155.52 \times 750 \times 54}{1728 \times 18} = \$202.50, \text{ Ans.}$$

Ex. 7. 28 oz. : (?) = $\left\{ \begin{array}{l} 2\frac{1}{2} \\ 6 \end{array} \right. : \left\{ \begin{array}{l} 150 \\ 4 \end{array} \right.$

$$(\text{?}) = 28 \text{ oz.} \times \frac{150}{4} \times \frac{4}{3} \times \frac{2}{3} \times \frac{1}{8} = 1120 \text{ oz.} = 70 \text{ lb., Ans.}$$

Ex. 8. 15 men $\times \frac{2}{3} = 60$ men, Ans.

Ex. 9. 12s. 7d. = 151d.; 1 oz. = 240 gr.;
15 lb. 11 oz. 13 pwt. 17 gr. = 92009 gr.;
240 gr. : 92009 gr. = 151d. : (?)

$$(\text{?}) = \frac{151 \text{d.} \times 92009}{240} = 28944.497 + \text{d.};$$

$$28944.497 \text{d.} \div 96 = \$301.50+, \text{ Ans.}$$

(257)

$$\text{Ex. 10. } \left\{ \begin{array}{l} 16 \\ 7 \\ 15 \end{array} \right. : \left\{ \begin{array}{l} 17\frac{1}{4} \\ 10\frac{1}{4} \\ 16 \end{array} \right. = \$36.72 : (?) \quad \begin{array}{c|c} (?) & \$36.72 \\ 16 & 17.5 \\ 7 & 10.5 \\ 15 & 16 \end{array}$$

$$(?) = \$64.26, \text{ Ans.}$$

$$\begin{aligned} \text{Ex. 11. } 2 \text{ yr. } 5 \text{ mo. } 5 \text{ da.} &= 29\frac{1}{8} \text{ mo.}; 1 \text{ yr. } 8 \text{ mo.} = 20 \text{ mo.}; \\ &\text{and since the money lent should vary inversely as} \\ &\text{the time, we have } 29\frac{1}{8} \text{ mo.} : 20 \text{ mo.} = (?) : \$1200; \\ &\$1200 \times 29\frac{1}{8} \\ (?) &= \frac{\quad}{20} = \$1750, \text{ Ans.} \end{aligned}$$

$$\text{Ex. 12. } \$9 : \$5 = \$10.50 : \$5.83\frac{1}{3}, \text{ Ans.}$$

$$\begin{aligned} \text{Ex. 13. } \left\{ \begin{array}{l} 12 \\ 9 \\ 15\frac{5}{8} \end{array} \right. : \left\{ \begin{array}{l} (?) \\ 7 \\ 15 \end{array} \right. &= 2 : 1 \quad \begin{array}{c|c} (?) & 12 \\ 7 & 9 \\ 15 & 2 \\ 9 & 140 \end{array} \\ 12-8 &= 4 \text{ men, Ans.} \quad (?) = 8 \text{ men} \end{aligned}$$

$$\begin{aligned} \text{Ex. 14. } 1 \text{ yr. } 8 \text{ mo.} &= 20 \text{ mo.}; 3 \text{ yr. } 4 \text{ mo. } 24 \text{ da} = 40.8 \text{ mo.}; \\ \left\{ \begin{array}{l} 300 \\ 20 \end{array} \right. : \left\{ \begin{array}{l} 210.25 \\ 40.8 \end{array} \right. &= \$30 : (?) \\ \$30 \times 210.25 \times 40.8 \\ (?) &= \frac{\quad}{300 \times 20} = \$42.891, \text{ Ans.} \end{aligned}$$

$$\begin{aligned} \text{Ex. 15. } \left\{ \begin{array}{l} (?) \\ \frac{3}{4} \end{array} \right. : \left\{ \begin{array}{l} 9\frac{1}{2} \\ 1\frac{1}{4} \end{array} \right. &= 1 : 1 \quad \begin{array}{c|c} (?) & 4 \\ 3 & 19 \text{ yd.} \\ 2 & 5 \end{array} \\ \text{Or, } \frac{3}{4} : 1\frac{1}{4} &= 9\frac{1}{2} \text{ yd.} : (?) \\ (?) &= \frac{1}{2} \text{ yd.} \times \frac{5}{4} \times \frac{4}{3} = 15\frac{5}{6} \text{ yd, Ans. } (?) = 15\frac{5}{6} \text{ yd, Ans.} \end{aligned}$$

$$\begin{aligned} \text{Ex. 16. } \left\{ \begin{array}{l} 24 \\ 18 \end{array} \right. : \left\{ \begin{array}{l} 38 \\ 22 \end{array} \right. &= \$95.60 : (?) \\ (?) &= \$95.60 \times \frac{3}{2} \times \frac{2}{18} = \$185.00+, \text{ Ans.} \\ &\quad (257, 258) \end{aligned}$$

Ex. 17. $16\frac{7}{8}$ Cd. : (?) = $11\frac{9}{8}$ T. : $15\frac{7}{8}$ T.

$$(?) = \frac{295}{18} \text{ Cd.} \times \frac{202}{13} \times \frac{26}{205} = 22\frac{4}{5} \text{ Cd., Ans.}$$

Ex. 18. $\begin{cases} 8 \\ 4\frac{1}{5} \\ 2\frac{1}{2} \end{cases} : \begin{cases} 18 \\ 3\frac{5}{8} \\ (?) \end{cases} = 75 : 450$

$$(?) = \frac{5}{2} \text{ ft.} \times \frac{21}{5} \times \frac{6}{7} \times \frac{450}{1} \times \frac{5}{2} \\ \times \frac{1}{18} \times \frac{1}{75} = 7\frac{7}{8} \text{ ft., Ans.}$$

Ex. 19. $\begin{cases} 4 \\ 2\frac{1}{2} \\ 8\frac{1}{4} \end{cases} : \begin{cases} 15 \\ 3\frac{3}{4} \\ 9 \end{cases} = 6\frac{3}{4} \text{ A. : } (?)$

$$(?) = \frac{20}{3} \text{ A.} \times \frac{15}{4} \times \frac{15}{7} \times \frac{2}{1} \times \frac{3}{8} \times \frac{4}{3} = 40\frac{19}{2} \text{ A., Ans.}$$

Ex. 20. $600 \times \frac{5}{10} \times \frac{1}{8} = 450 \text{ men, Ans.}$

Ex. 21. 120 gal.—80 gal.=40 gal. gained in 1 hour;

20 bar.=630 gal. to be filled;

40 gal. : 630 gal.=1 h. : $15\frac{3}{4}$ h., Ans.

Ex. 22. 16 oz.— $14\frac{9}{16}$ oz.= $1\frac{7}{16}$ oz.= $\frac{23}{16}$ oz. Now, if every 16 ounces of groceries have been lessened $\frac{23}{16}$ ounces,

how much should the price, \$38.40, be lessened?

16 oz. : $1\frac{7}{16}$ oz.= \$38.40 : \$3.45, Ans.

Another Solution.

If every 16 oz. be reduced to $14\frac{9}{16}$, to what sum should the cost, \$38.40, be reduced?

$$16 \text{ oz. : } 14\frac{9}{16} = \$38.40 : \$34.95$$

$$\$38.40 - \$34.95 = \$3.45, \text{ Ans.}$$

Ex. 23. 75 lb. coffee $\times \frac{8}{5} = 120$ lb. sugar;

$$5 \text{ lb. : } 120 \text{ lb.} = \$6.25 : \$15, \text{ Ans.}$$

Ex. 24. $\$28.75 \times \frac{40}{3} = \$385.83, \text{ Ans.}$

Ex. 25. $\begin{cases} 12000 \\ 8 \\ 550 \end{cases} : \begin{cases} 859\frac{3}{8} \\ 12 \\ 320 \end{cases} :: \begin{cases} 3000 \\ 12 \\ 320 \end{cases}$

$$\frac{12000}{550} \times \frac{12}{8} \times \frac{320}{859\frac{3}{8}} \times \frac{6875}{8} = 2092\frac{25}{2}, \text{ Ans.}$$

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GENERAL PROBLEMS IN PERCENTAGE.

(449, page 261.)

- Ex. 5. Ans. 70.65 lb. Ex. 6. Ans. 240 mi.
 Ex. 8. Ans. 919 men. Ex. 9. $756 \times 1.25 = 945$, Ans.
 Ex. 12. $\frac{3}{8} \times 4\frac{3}{8} = 1\frac{1}{8}$, Ans.
 Ex. 13. $14\frac{3}{4} \% = \frac{1}{4}$; $\frac{1}{4} \times \frac{1}{4} = \frac{1}{16}$, Ans.
 Ex. 14. $\$375 \times .05 = \$18.75$, Ans.
 Ex. 15. $\$536 + \$450 + \$784 = \$1770$, debts;
 $\$1770 \times .54 = \$955.80$, Ans.
 Ex. 16. $15 \% + 5 \% + 6 \% + 8 \% = 34 \% = .34$;
 $\$1500 \times .34 = \$510$, Ans.
 Ex. 17. $\$3500 \times 3 = \$10500$, received in 3 years;
 $10 \% + 12 \% + 18 \% = 40 \%$; $\$3500 \times .40 = \$1400$
 spent in 3 years; $\$10500 - \$1400 = \$9100$, Ans.
 Ex. 18. $1.00 - .25 = .75$; $.75 \times .30 = .225$;
 $.25 + .225 = .475$ drawn;
 $.475 \times .10 = .0475$ deposited again;
 $1.00 - .4275 = .5725$ in bank;
 $\$6000 \times .5725 = \$3435$, Ans.
 Ex. 19. $2 \% + 3\frac{1}{4} \% + 2 \% + 2\frac{1}{2} \% + 1\frac{1}{2} \% + 2\frac{3}{4} \% + 4 \%$
 $+ 3 \% = 21 \%$ entire gain;
 $\frac{1}{2} \% + 1\frac{1}{4} \% + 1 \% + \frac{1}{4} \% = 4 \%$ " loss;
 17% net profits,
 $\$5400 \times .17 = \$918$, Ans.

(450, page 263.)

- Ex. 1. $\$21.60 \div \$720 = .03 = 3 \%$, Ans.
 Ex. 2 $234 \div 1560 = .15 = 15 \%$, Ans.
 Ex. 8. $49 \div 980 = .05 = 5 \%$, Ans.

(261-263)

Ex. 4. £320 10 s. = £320.5; £25 12.8 s. = £25.64;

$$25.64 \div 320.5 = .08 = 8 \% , \text{ Ans.}$$

Ex. 5. 5 gal. 3 qt. = 5.75 gal.;

$$5.75 \div 46 = .125 = 12\frac{1}{2} \% , \text{ Ans.}$$

Ex. 6. $5.495 \div 7.85 = .7 = 70 \% , \text{ Ans.}$

Ex. 7. $\frac{2}{3} \div \frac{8}{15} = \frac{5}{4} = .75 = 75 \% , \text{ Ans.}$

Ex. 8. $\frac{3}{5} \div \frac{4}{7} = \frac{21}{100} = .21 = 21 \% , \text{ Ans.}$

Ex. 9. $80 \div 560 = \frac{1}{7} = 14\frac{2}{7} \% , \text{ Ans.}$

Ex. 10. $26.01 \div 578 = .045 = 4\frac{1}{2} \% , \text{ Ans.}$

Ex. 11. $\$145,836 \div \$972.24 = 15 \% , \text{ Ans.}$

Ex. 12. $448 \div 5600 = 8 \% , \text{ Ans.}$

Ex. 13. $4914 \div 7560 = 65 \% , \text{ Ans.}$

Ex. 14. $455 \div 2600 = 17\frac{1}{2} \% , \text{ Ans.}$

Ex. 15. 720 bar. — 288 bar. = 432 bar. unsold;

$$432 \div 720 = 60 \% , \text{ Ans.}$$

Ex. 16. $\frac{4}{5} \times \frac{30}{100} = \frac{6}{5}$; $\frac{6}{5} \div 1 = \frac{6}{5} = \frac{24}{100} = 24 \% , \text{ Ans}$

Ex. 17. \$23,243,822.38

$$14,712,610.21$$

$$\$37,956,432.59 \div \$83,751,511.57$$

$$= .4532 = 45\frac{1}{2} \% \text{ nearly, Ans.}$$

Ex. 18. $165 \times 5 = 825$, aggregate number of questions asked

$$130 + 125 + 96 + 110 + 160 = 621, \text{ number answered}$$

$$621 \div 825 = .7527 = 75.27 \% , \text{ Ans.}$$

(451, page 264.)

Ex. 1. $18 \div .25 = 72, \text{ Ans.}$

Ex. 2. $54 \div .15 = 360, \text{ Ans.}$

Ex. 3. $17.5 \div .02\frac{1}{3} = 750, \text{ Ans}$

Ex. 4. $2.28 \div .05 = 45.6, \text{ Ans.}$

Ex. 5. $414 \div 1.20 = 345, \text{ Ans.}$

Ex. 6. $6119 \div 1.055 = 5800, \text{ Ans.}$

(263, 264)

- Ex. 7. $.43 + .71\frac{1}{2} = .6$, *Ans.*
 Ex. 8. $\$18.75 \div .025 = \$750$, *Ans.*
 Ex. 9. $31\frac{1}{4} \div .31\frac{1}{4} = 100$, *Ans.*
 Ex. 10. $\$4578 \div .84 = \$5450$, *Ans.*
 Ex. 11. $1.00 - .30 = .70$ %, sold; $8150 \div .70 = 4500$, *Ans.*
 Ex. 12. $.40 \times .13\frac{1}{2} = .05\frac{1}{2}$ for the carriage;
 $\$116 \div .05\frac{1}{2} = \$2175$, *Ans.*
 Ex. 13. $\$147.56 \div .13\frac{1}{2} = \$1106.70$, A's;
 $\$1106.70 \times .04\frac{3}{4} = \$51.646$;
 $\$51.646 \div .08 = \$645.575$, B's;
 $\$1106.70 - \$645.575 = \$461.125$, *Ans.*
 Ex. 14. 100 % — 4 % = 96 %, left after the battle;
 $.96 \times .05 = .048 = 4\frac{1}{2}$ %, died of wounds;
 $4\frac{1}{2}$ % — 4 % = $\frac{1}{2}$ % = $.008$, difference;
 $168 \div .008 = 21000$, *Ans.*
 Ex. 15. A has $\frac{2}{3}$ and B $\frac{1}{4}$ of the prize;
 $1.00 - .40 = .60$; $\frac{2}{3} \times \frac{60}{100} = .45$ of prize, A's remainder,
 $1.00 - .20 = .80$; $\frac{1}{4} \times \frac{80}{100} = .20$ " B's "
 $.45 - .20 = .25$; $\$1950 \div .25 = \$7800$, *Ans.*

(452, page 265.)

- Ex. 1. $1.00 + .15 = 1.15$; $644 \div 1.15 = 560$, *Ans.*
 Ex. 2. $1.00 + .04 = 1.04$; $\$815.36 \div 1.04 = \$784$, *Ans.*
 Ex. 3. $1.00 + .12 = 1.12$; $\$3800 \div 1.12 = \$3392.86$ —, *Ans.*
 Ex. 4. $1.00 + .10 = 1.10$; $39600 \div 1.10 = 36000$, *Ans.*
 Ex. 5. $1.00 + 1.08 = 2.08 = 208$ % of last year's crop, raised
 in the two years; hence,
 $5200 \text{ bu} \div 2.08 = 2500 \text{ bu.}$, *Ans.*
 Ex. 6. $1.00 + 1.05 = 2.05$;
 $\$6970 \div 2.05 = \$3400$, 1st year's crop;
 $\$3400 \times 1.05 = \$3570$, 2d " "

(264—266)

Ex. 7. If the number be increased 8 %, the amount will be 108 % of the number; and if this amount be increased 7 %, the whole amount will be 107 % of 108 %, or $1.08 \times 1.07 = 1.1556$ times the number; hence $86.67 \div 1.1556 = 75$, *Ans.*

Ex. 8. Since he gained $1\frac{1}{2}$ % in measure and 5 % in price, he sold 1.015 times the number of bushels bought, at 1.05 times the buying price; hence he received $1.015 \times 1.05 = 1.06575$ times the cost; and $\$4910.976 \div 1.06575 = \$4608$, *Ans.*

Ex. 9. $1.00 = A$'s proportion;
 $1.06 = B$'s "
 $1.04 = C$'s "

 $3.10 =$ all their money;
 $\$11160 \div 3.10 = \$3600$, *Ans.*

Ex. 10. The material cost 200 % of the labor; the cost of labor increased 9 %, would be 109 % of the labor; the cost of material increased 6 %, would be 212 % of the labor; hence the cost of the house, thus increased, would be $109 \% + 212 \% = 321 \%$ of the cost of labor; and $\$1284 \div 3.21 = \$400$, cost of labor;
 $\$400 \times 2 = \$800$ " material;

 $\$1200$, *Ans.*

(453, page 267.)

Ex. 1. $1.00 - .10 = .90$; $504 \div .90 = 560$, *Ans.*

Ex. 2. $1.00 - .08 = .92$; $\$4.37 \div .92 = \$4.75$, *Ans.*

Ex. 3. $1.00 - .15 = .85$; 40 bu. $3\frac{1}{2}$ pk. = 40.8 bu.;
 $40.8 \text{ bu.} \div .85 = 48 \text{ bu.}$, *Ans.*

Ex. 4. $1.00 - .36 = .64$; $224 \text{ A.} \div .64 = 350 \text{ A.}$, *Ans.*

(266. 267)

- x. 5. $1.00 - .65 = .35$; $\$2590 \div .35 = \$7400$, *Ans.*
- x. 6. Having drawn out 20 % of his deposit, he had
 $100\% - 20\% = 80\%$ of his deposit, in bank; and
 80 % of his deposit is 80 % of 80 % of his fortune;
 $.80 \times .80 = .64$; $\$5760 \div .64 = \$9000$, *Ans.*
- x. 7. $100\% - 12\% = 88\%$ of his share sold to B; and
 $\frac{7}{8} \times \frac{88}{100} = .77$ of the ship sold to B;
 $\$20020 \div .77 = \$26000$, *Ans.*
- x. 8. $1.00 - .10 = .90$, left after the first battle;
 $.90 \times .10 = .09$; $.90 - .09 = .81$, left after 2d battle;
 $6480 \div .81 = 8000$ men, *Ans.*
- x. 9. B's asking price was $1.00 + .50 = 1.50 = 150\%$ of A's;
 $1.00 - .20 = .80$; that is, A's reduced price was 80 %
 of his asking price; $1.50 \times .30 = .45$; $1.50 - .45$
 $= 1.05$; that is, B's reduced price was 105 % of
 A's asking price; hence the sum of the reduced
 prices was $80\% + 105\% = 185\%$ of A's asking
 price; and $\$148 \div 1.85 = \$80$, A's asking price;
 $\$80 \times 1.50 = \$120$, B's " "

NOTE.—In this solution A's asking price is the *base* to which all the rates are referred.

- x. 10. Of the whole sum expended, $\frac{1}{3}$ was for wheat, $\frac{1}{3}$ for corn, and $\frac{1}{3}$ for oats; hence we have
 6 % of $\frac{1}{3} = 2\%$, cleared on wheat;
 8 % of $\frac{1}{3} = 1\%$, " " corn;
 17 % of $\frac{1}{3} = 5\frac{2}{3}\%$, lost " oats;
 $2\frac{2}{3}\%$, net loss;
 $1.00 - .02\frac{2}{3} = .97\frac{1}{3}$, saved;
 $\$2336 \div .97\frac{1}{3} = \$2400$, whole sum expended;
 $\$2400 \div 3 = \$800$, sum expended for each kind.

APPLICATIONS OF PERCENTAGE

COMMISSION.

(462, page 270.)

Ex. 4. $\$8600 \times .02\frac{1}{4} = \$193.50$, *Ans.*

Ex. 5. $\$750.75 \times .03\frac{1}{4} = \$28.15 +$, *Ans.*

Ex. 6. $\$1.40 \times 3500 = \$4900$

$\$.74 \times 3600 = 2664$

$\$7564 \times .02\frac{1}{4} = \$170.19$, *Ans.*

Ex. 7. $\$.23\frac{1}{2} \times 2000 = \$ 470$

$.22 \times 5650 = 1243$

$.23 \times 450 = 103.50$

$.21 \times 650 = 136.50$

$\$1953. \times .08\frac{1}{2} = \$162.75$, *Ans.*

Ex. 8. $\$25372 \times .06\frac{1}{4} = \$1585.75$, commission;

132. , storage;

$\$1717.75$, entire charges;

$\$25372 - \$1717.75 = \$23654.25$, *Ans.*

Ex. 9. $\$25 \times 40 = \$1000$, cost of apple trees;

$50 \times 20 = 1000$, " " pear "

$20 \times 16 = 320$, " " peach "

$50 \times 18 = 900$, " " cherry "

$50 \times 5 = 250$, " " plum "

$\$3470$, amount of sale;

$\$3470 \times .30 = \$1041$, commission;

$\$ 203.50$, expended;

$\$3470 - \$1244.50 = \$2225.50$, proceeds, *Ans.*

Ex. 10. $\$785 \times .82 = \$643.70$, sum collected;

$\$643.70 \times .05 = \$32.185$, commission, *Ans.*

- Ex. 11. $\$1.25 \times 4000 = \$5000$, cost;
 $\$1.50 \times 4000 = \$6000$, receipts;
 $\$6000 \times .03 = \$180$, commission;
 $\$180 + \$1.15 = \$595$; $\$6000 - \$595 = \$5405$, net
 proceeds. $\$5405 - \$5000 = \$405$, Ans.
- Ex. 12. $\$63 \div \$1260 = .05 = 5\%$, Ans.
- Ex. 13. $\$4.50 \times 264 = \$1188$, base of commission;
 $\$74.25 \div \$1188 = .0625 = 6\frac{1}{4}\%$, Ans.
- Ex. 14. $\$7850 - \$7732.25 = \$117.75$, commission;
 $\$117.75 \div \$7850 = .015 = 1\frac{1}{2}\%$, Ans.
- Ex. 15. $\$.12\frac{1}{2} \times 28000 = \$3500$, receipts;
 $\$35.36 + \$10.50 = \$45.86$, charges;
 $\$3500 - \$3252.89 = \$247.11$, com. and charges;
 $\$247.11 - \$45.86 = \$201.25$, commission;
 $\$201.25 \div \$3500 = .0575 = 5\frac{3}{4}\%$, Ans.
- Ex. 16. $\$5635 + \$115 = \$5750$, receipts;
 $\$115 \div \$5750 = .02 = 2\%$, Ans.
- Ex. 17. $\$22.40 \div .04 = \$560$, Ans.
- Ex. 18. $\$6.80 \div .08 = \$85$, Ans.
- Ex. 19. $\$255 \div 1.02 = \$250$ to be invested;
 $\$250 = \$15 = 1666\frac{2}{3}$ yd., Ans.
- Ex. 20. $\$7.50 \times 860 = \$6450$, receipts;
 $\$6450 \times .02\frac{1}{2} = \$161.25$, commission on sale;
 $\$6450 - \$161.25 = \$6288.75$, net proceeds of sale.
 $\$6288.75 \div 1.015 = \$6195.81 +$, Ans.
- Ex. 21. $\$.06 \times 24000 = \$1440$, receipts for pork;
 $\$1440 \times .05 = \$72$, commission on sale of pork.
 $\$1440 - \$72 = \$1368$, net proceeds;
 $\$3000 + \$1368 = \$4368$;
 $\$4368 \div 1.05 = \$4160$ to be invested;

$\$4368 - \$4160 = \$208$, commission for investing,
 $\$72 + \$208 = \$280$, *Ans.*

Ex. 22. $1.00 - .06 = .94$; $\$3290 \div .94 = \$3500$, *Ans.*

Ex. 23. $\$6290 + \$500 = \$6790$, receipts, less the commission
 $1.00 - .03 = .97$; $\$6790 \div .97 = \$7000$, receipts;
 $\$7000 \div 500 = \$14$, *Ans.*

Ex. 24. $\$3500 \times .04 = \$140$, purchase commission;
 $\$3500 + \$140 = \$3640$, net proceeds of auction sale;
 $1.00 - .09 = .91$; $\$3640 \div .91 = \$4000$, *Ans.*

Ex. 25. Since the purchase commission was 2 % of the price of the city lots, the net proceeds of the sale of cotton were 102 % of the cost of the city lots; and as the proceeds divided by 1 minus the rate equal the sale, we have $102 \% \div .97 = 105\frac{1}{3}\%$; that is, the sale of the cotton was $105\frac{1}{3}\%$ of the price of the city lots; now, as the difference between the receipts from the cotton and the price of the lots is the whole commission, $\$265$ is $1.05\frac{1}{3}\% - 1.00 = 5\frac{1}{3}\%$ of the price of the lots; therefore,

$$\$265 \div .05\frac{1}{3} = \$5141, \text{ } Ans$$

Ex. 26. $1. - .0075 = .9925$;
 $\$5000 \div .9925 = \$50377.83$, *Ans.*

STOCKS.

STOCK-JOBGING.

(480, page 275.)

Ex. 4. $\$1500 \times 1.12 = \$1680$, *Ans.*

Ex. 5. $\$1.35 - \$0.0175 = \$1.3325$, proceeds of \$1;
 $\$2000 \times 1.3325 = \$2665$, *Ans.*

(271-275)

- Ex. 6. $\$.8075 + \$.005 = \$.8125$, cost of \$1 of stock;
 $\$12000 \times .8125 = \$9750$, *Ans.*
- Ex. 7. $1.075 + .0025 = 1.0775$;
 $\$3600 \times 1.0775 = \$3879$, *Ans.*
- Ex. 8. $1.00 - .60\frac{7}{8} = .39\frac{1}{8} = .39125$;
 $\$21910 \div .39125 = \$56000 = 560$ shares, *Ans.*
- Ex. 9. $\$40150 - \$40000 = \$150$, premium;
 $\$150 \div \$40000 = \frac{150}{40000} = \frac{3}{800} = \frac{3}{8}\%$, *Ans.*
- Ex. 10. $\$.94875 + \$.0125 = \$.96125$, cost of \$1;
 $\$48447 \div .96125 = \$50400 = 504$ shares, *Ans.*
- Ex. 11. $\$6 \times 830 = \$4980$, receipts; $\$4980 \times .05 = \$249$, com-
mission; $\$4980 - \$249 = \$4731$, net proceeds of sale;
 $.82\frac{3}{4} + .00\frac{1}{4} = .83$;
 $\$4731 \div .83 = \$5700 = 57$ shares, *Ans.*
- Ex. 12. $\$500 \times 18 = \$9000$, par value of stock;
 $.02 + .28 = .30$, rate of loss;
 $\$9000 \times .30 = \$2700$, *Ans.*
- Ex. 13. $\$3600 \times .95 = \$3420$, value of railroad bonds;
 $\$2700 \times 1.03 = 2781$, value of bank stock;

 $\$ 639$, *Ans.*
- Ex. 14. $\frac{25 \times 104}{100} = 520$ shares, *Ans.*
- Ex. 15. $\$1200 \times 1.05 = \$1260$, purchase price;
 $\$1260 - \$96 = \$1164$, selling price;
 $\$1164 \div \$1200 = .97 = 97\%$, price per share, *Ans.*
- Ex. 16. $\$64000 \times 1.02 = \$65280$, cost;
 $\$65280 + \$2560 = \$67840$, to be sold for;
 $\$67840 \div \$64000 = 1.06 = 106\%$, *Ans.*

(275, 276)

- Ex. 17. $\$25000 \times 1.03 = \$25750$, cost of mining stock;
 $\$15000 \times .95 = 14250$, " " railroad "
 $\$40000$, money invested;
 $\$40000 \div .80 = \$50000$, par val. of N. Y. C. stock
 $\$50000 \times .85 = \$42500$, money received;
 $\$42500 - \$40000 = \$2500$, *Ans.*
- Ex. 18. $\$750 \div .03 = \$25000 = 250$ shares, *Ans.*
- Ex. 19. $105\% - 103\% = 2\%$, gained;
 $\$240 \div .02 = \$12000$, *Ans.*
- Ex. 20. $4\% + 5\frac{1}{2}\% = 9\frac{1}{2}\%$, loss;
 $\$760 \div .095 = \$8000 = 80$ shares, *Ans.*
- Ex. 21. $1.06 + .0125 = 1.0725$;
 $\$6864 \div 1.0725 = \$6400$, par value of bonds bought;
 $1.12 - .015 = 1.105$;
 $\$6400 \times 1.105 = \$7072$, stock sold for;
 $\$7072 - \$6864 = \$208$, *Ans.*
- Ex. 22. $7\% - 3\% = 4\%$, gain;
 $\$480 \div .04 = \$12000$, par value of stock;
 $\$12000 \times 1.03 = \$12360$, money invested, *Ans.*
- Ex. 23. $.04 + .005 = .045$; $1.00 - .045 = .955$;
 $\$4775 \div .955 = \$5000 = 50$ shares, *Ans.*

INSTALLMENTS, ASSESSMENTS AND DIVIDENDS.

(487, page 277.)

- Ex. 3. $\$5600 \times .78 = \$448$, *Ans.*
- Ex. 4. $\$15000 \times .06 = \$900 = 9$ shares,
 $\$15000 = 150$ "
 159 shares, *Ans.*
 (276. 277)

Ex. 5. $\$6500 \times .15 = \$975$, *Ans.*

Ex. 6. $\$600 \div .04 = \$15000$, *Ans.*

Ex. 7. $\$99280 - \$56400 = \$42880$, dividend;
 $\$42880 \div \$536000 = .08 = 8\%$, *Ans.*

Ex. 8. $\$56000 \times .06 = \$3360$, dividend;
 $\$3616 - \$3360 = \$256$, *Ans.*

Ex. 9. $\$450000 \times .05\frac{1}{2} = \$25000$, interest;
 $\$25000 + \$217621 = \$242621$, disbursements;
 $\$407399 - \$242621 = \$164778$, net earnings;
 $\$164778 - \$78 = \$164700$, dividend;
 $\$164700 \div \$1830000 = .09$, rate of dividend;
 $\$3000 \times .09 = \$270$, *Ans.*

Ex. 10. $\$540000$
400000

$\$940000$, entire cost of the road;
800000, capital stock available;

$\$140000$, to be assessed;
 $\$140000 \div \$800000 = .17\frac{1}{2} = 17\frac{1}{2}\%$, *Ans.*

Ex. 11. $\$156753.19 \div .0525 = \$2,985,775$ nearly, *Ans.*

Ex. 12. $\$574375.25$
643672.36

$\$1218047.61$, gross earnings;
651113.53

$.08) \$566934.08$, net earnings;

$\$7086676$, capital stock, *Ans.*

Ex. 13. $504 \div 1.05 = 480$, *Ans.*

Ex. 14. $.06 \div .75 = .08$; hence, a 6% dividend invested at 75% is equal to an 8% dividend invested at par;
 (277. 278)

Therefore,

$\$16200 \div 1.08 = \$15000$, his stock before the div.;

$\$16200 - \$15000 = \$1200$, increase of his stock;

$\$1200 \times .75 = \$900$, value of the increase at 75 %;
or the money received in the dividend, *Ans.*

Ex. 15. $.05 + .05 = .10$, annual rate of dividend;

$\$28000 \times .10 = \$2800$, dividend;

$\$2800 + \$2950 = \$5750$, *Ans.*

STOCK INVESTMENTS.

(490, page 281.)

Ex. 1. $\$50000 \div 1.025 = \$48780.48$, stock purchased;

$\$48780.48 \times .04 = \$1951.22$, income;

$\$1951.22 - \$1000 = \$951.22$, *Ans.*

Ex. 2. $.95\frac{1}{2} + .00\frac{1}{2} = .96$; $1.12 + .00\frac{1}{2} = 1.12\frac{1}{2}$;

$\$48000 \div 2 = \$24000$, invested in each kind of stock;

$\$24000 \div .96 = \$25000$, purchased of 5 % stock;

$\$24000 \div 1.12\frac{1}{2} = \$21333.33\frac{1}{3}$, " 6 % "

$\$25000 \times .05 = \$1250$, income from the 5's;

$\$21333.33\frac{1}{3} \times .06 = \$1280$, " " " 6's;

$\$1250 + \$1280 = \$2530$, *Ans.*

Ex. 3. $\$32300 \div .85 = \$38000$, purchase of 6's;

$\$32300 \div .95 = \$34000$, " " 7's;

$\$38000 \times .06 = \$2280$, income from 6's;

$\$34000 \times .07 = \$2380$, " " 7's;

$\$100$, *Ans.*

Ex. 4. $1.05 + .00125 = 1.05125$, cost of \$1 of stock;

$\$8199.75 \div 1.05125 = \$7800$, stock purchased;

$\$7800 \times .06 = \$468$, income from stock;

$\$468 - \$411.45 = \$56.55$, increase, *Ans.*

(278—281)

- Ex. 5. $\$8700 \times .06 = \$522$, income from 6's;
 $1.04 - .00\frac{1}{8} = 1.03\frac{7}{8}$;
 $\$8700 \times 1.03\frac{7}{8} = \$9037.13$;
 $.94 + .00\frac{1}{8} = .94\frac{1}{8}$;
 $\$9037.13 \div .94\frac{1}{8} = \$9601.20$, par value of the
amount of stock that could be purchased. But,
since each share is worth \$100, and only whole
shares can be purchased, he could purchase only
\$9600 worth of stock.
 $\$9600 \times .05 = \$480$, income from 5's;
 $\$522 - \$480 = \$42$, lost, *Ans.*

(491, page 282.)

- Ex. 1. $\$960 \div .06 = \$16000$, stock required;
 $\$16000 \times .84 = \$13440$, investment, *Ans.*
- Ex. 2. $\$1500 \div .06 = \$25000$, stock required;
 $\$25000 \times .97 = \$24250$, investments, *Ans.*
- Ex. 3. $\$1752 \div .073 = \$24000$, stock required;
 $\$24000 \times 1.06 = \$25440$, investment, *Ans.*
- Ex. 4. $\$1.075 + \$.005 = \$1.08$, cost of \$1 of stock, U. S. 4's;
 $.985 + \$.005 = .99$, cost of \$1 of stock, R. R. 5's;
Every time \$1 is invested in U. S. 4's, \$2 is in-
vested in R. R. 5's;
For \$1, $\frac{1}{100}$ of a share of U. S. 4's can be bought;
For \$2, $\frac{2}{99}$ of a share of R. R. 5's can be bought;
Income of \$1 invested in 4's = $\$.04 \times \frac{1}{100} = \$.03\frac{1}{25}$;
Income of \$2 invested in 5's = $\$.05 \times \frac{2}{99} = \$.10\frac{1}{99}$;
 $\$.03\frac{1}{25} + \$.10\frac{1}{99} = \$.13\frac{2}{2475}$, inc. on every \$3 in-
vested.
To receive an income of \$1674, he must invest \$3
as many times as $\$.13\frac{2}{2475}$ is contained times in
\$1674, which is 12126.29 times. He must there-
fore invest \$12126.29 in U. S. 4's and \$24252.58
in R. R. 5's, *Ans.*

(281—282)

(492, page 283.)

- Ex. 1. $.06 \div 1.08 = .05\frac{5}{9} = 5\frac{5}{9} \%$, *Ans.*
- Ex. 2. $.06 \div .84 = .07\frac{1}{4} = 7\frac{1}{4} \%$, *Ans.*
- Ex. 3. $1.34\frac{1}{2} + .01\frac{1}{2} = 1.36$;
 $.085 \div 1.36 = .0625 = 6\frac{1}{4} \%$, *Ans.*
- Ex. 4. $.05 \div .70 = .07\frac{1}{2}$, rate on investment in 5's;
 $.06 \div .80 = .07\frac{1}{2}$ " " " " 6's better.
- Ex. 5. $.08 \div 1.20 = .06\frac{2}{3}$,
 $.05 \div .75 = .06\frac{2}{3}$, } rates on investments equal.
- Ex. 6. $.073 \div 1.06 = .069\frac{17}{33} = 6\frac{17}{33} \%$, *Ans.*
- Ex. 7. $.06 \div 1.085 = .05\frac{11\frac{5}{7}}{17}$, rate on investment in 5-20's;
 $.05 \div .98 = .05\frac{5}{49}$, " " " 10-40's;
 $.05\frac{11\frac{5}{7}}{17} - .05\frac{5}{49} = .00\frac{650}{1519} = \frac{650}{1519} \%$, *Ans.*
- Ex. 8. $\$10000 \div .98 = \$10204.08 +$, purchase of 10-40's;
 $\$10204.08 \div 1.02 = \$10004$, " " 7.30's;
 $\$10004 \times .073 = \$730.292$, income from 7.30's;
 $\$730.292 \div \$10000 = .073 + = 7\frac{3}{10} \%$, nearly, *Ans.*
- Ex. 9. $.06 \div 1.05 = .05\frac{5}{7} = 5\frac{5}{7} \%$, *Ans.*

(493, page 284.)

- Ex. 1. $.05 \div .08 = 62\frac{1}{2} \%$, *Ans.*
- Ex. 2. $.06 \div .0625 = 96 \%$, purchase price;
 $100 \% - 96 \% = 4 \%$, *Ans.*
- Ex. 3. $.07 \div .06 = 1.16\frac{2}{3}$, market price;
 $1.16\frac{2}{3} - 1 = .16\frac{2}{3} = 16\frac{2}{3} \%$, *Ans.*
- Ex. 4. $.06 \div .08\frac{1}{3} = 72 \%$, *Ans.*
- Ex. 5. $.05 \div .06 = .83\frac{1}{3} = 83\frac{1}{3} \%$, *Ans.*
- Ex. 6. $.06 \div .05 = 1.20$, purchase price;
 $1.20 - 1.00 = .20 = 20 \%$, premium, *Ans.*
- Ex. 7. $.073 \div .10 = .73$, purchase price;
 $1.00 - .73 = .27 = 27 \%$, discount, *Ans.*
- Ex. 8. $.06 \div .07 = .85\frac{5}{7} = 85\frac{5}{7} \%$, *Ans.*

GOLD INVESTMENTS.

(493 a, page 286.)

- Ex. 2. $\$1.42\frac{3}{4} \times 250.47 = \$357.546$ — *Ans.*
- Ex. 3. $\$6000 \times .05 = \$300$, income in gold;
 $\$1.57 \times 300 = \$471$, “ “ currency, *Ans.*
- Ex. 4. $\$1.385 \times 5500 = \$7617.50$, cost in currency by second offer;
 $\$7617.50 - \$7000 = \$617.50$, loss, *Ans.*
- Ex. 5. $\$1.40 \times 3 = \$4.20$, cost of cloth in currency;
 $\$4.20 - \$4.00 = \$.20$, loss in currency per yd.;
 $\$.20 \div \$4.20 = .04\frac{1}{2}\frac{6}{1} = 4\frac{1}{2}\frac{6}{1} \%$, *Ans.*
- Ex. 6. $\$1.34 \times 3000 = \$4020$, value of gold in currency;
 $\$4020 \div 1.02 = \$3941\frac{3}{17}$, stock purchased;
 $\$3941\frac{3}{17} \times .06 = \$236.47\frac{3}{51}$, income on stock in gold;
 $\$236.47\frac{3}{51} \times 1.34 = \$316.87\frac{1}{17}$, “ “ “ “ currency, *Ans.* to first.
 $\$316.87\frac{1}{17} \div \$4020 = .07\frac{1}{17}\frac{5}{7} = 7\frac{1}{17}\frac{5}{7} \%$, *Ans.* to last.
- Ex. 7. $\$10000 \div 1.04 = \$9615\frac{5}{13}$, stock purchased;
 $\$9615\frac{5}{13} \times .06 = \$576.92\frac{4}{13}$, income in gold;
 $\$1.37 \times 576.92\frac{4}{13} = \$790.38\frac{6}{13}$, “ “ currency, *Ans.*

(493 a, Case II., page 286.)

- Ex. 2. $\$1.00 \div \$2.03 = .49\frac{5}{103} = 49\frac{5}{103} \%$, *Ans.*
- Ex. 3. $\$1.00 \div \$1.34 = .74\frac{4}{17} = 74\frac{4}{17} \%$;
 $100 \% - 74\frac{4}{17} \% = 25\frac{3}{17} \%$, *Ans.* to first.
 $\$1.00 \div \$3.98 = .25\frac{2}{199} = 25\frac{2}{199} \%$;
 $100 \% - 25\frac{2}{199} \% = 74\frac{1}{199} \%$, *Ans.* to the last.
- Ex. 4. $\$1.00 \div \$.20 = 5.00 = 500 \%$, *Ans.* to first.
 $\$1.00 \div \$.30 = 3.33\frac{1}{3} = 333\frac{1}{3} \%$, “ “ second.
 $\$1.00 \div \$.50 = 2.00 = 200 \%$, “ “ third.
 $\$1.00 \div \$.15 = 6.66\frac{2}{3} = 666\frac{2}{3} \%$, “ “ fourth.
 $\$1.00 \div \$.25 = 4.00 = 400 \%$, “ “ fifth.
 $\$1.00 \div \$.72 = 1.38\frac{5}{9} = 138\frac{5}{9} \%$, “ “ sixth.

(285—286)

- Ex. 5. $\$250 \div 1.75 = \$142\frac{2}{7}$, value of currency in gold;
 $\$142\frac{2}{7} \div \$.25 = 571\frac{3}{7}$ yds., *Ans.*
- Ex. 6. $\$7800 \times .073 = \$569.40$, income from 7.30's in cur.;
 $\$569.40 \div 1.45 = \$392\frac{2}{9}$ " " " gold;
 $\$7800 \times 1.05 = \$8190$, selling price of 7.30's;
 $\$8190 \div 1.45 = \$5648\frac{8}{9}$, gold purchased;
 $\$5648\frac{8}{9} \div .60 = \$9413\frac{2}{3}$, 10-40's purchased;
 $\$9413\frac{2}{3} \times .05 = \$470\frac{2}{3}$, inc. from 10-40's in gold;
 $\$470\frac{2}{3} - \$392\frac{2}{9} = \$78$, increase of income, *Ans.*
- Ex. 7. The income from \$1.00 invested in bond and mortgage is \$.07 in currency, and
 $\$.07 \div \$1.34 = .05\frac{1}{8}\frac{5}{7} = 5\frac{1}{8}\frac{5}{7} \%$, income in gold from mortgage;
 $5\frac{1}{8}\frac{5}{7} \% - 5 \%$ (rate of income on 10-40's) $= \frac{1}{8}\frac{5}{7} \%$, mortgage better than 10-40's.

PROFIT AND LOSS.

(495, page 287.)

- Ex. 4. $\$7650 \times .20 = \$1530$, advance;
 $\$1530 - \$480 = \$1050$, *Ans.*
- Ex. 5. $\$.15 \times 320 = \$48$, cost; $\$48 \times .025 = \$1.20$, *Ans.*
- Ex. 6. $\$3.50 \times 30 = \$105$, purchase price;
 $\$105 \times .90 = \$94.50$, selling "
 $\$94.50 \times .05 = \$4.72\frac{1}{2}$, commission;
 $\$105 + \$4.72\frac{1}{2} + \$5.38 = \$115.10\frac{1}{2}$, whole outlay;
 $\$115.10\frac{1}{2} - \$94.50 = \$20.60\frac{1}{2}$, *Ans.*
- Ex. 7. $1 + .33\frac{1}{3} = 1.33\frac{1}{3} = 1\frac{1}{3}$; $\$.50 \times 1\frac{1}{3} = \$66\frac{2}{3}$, *Ans.*
 (286-287)

- Ex. 8. $\$1.93 - \$4.25 = \$.68$, gain per quintal;
 $\$.68 \div \$4.25 = .16 = 16\%$, *Ans.*
- Ex. 9. $\$59 \times .20 = \$11.80$, advance of 20 %;
 $\$59 + \$11.80 + \$4.72 = \$75.52$, to be sold for;
 $\$75.52 \div 944 = \$.08$, *Ans.*
- Ex. 10. $\$157.50 \times .05 = \$7.875$, whole loss;
 $\$157.50 - \$7.875 = \$149.625$, sold for;
 $\$149.625 \div \$3.325 = 45$ gallons sold;
63 gal.—45 gal.=18 gal., *Ans.*
- Ex. 11. 106 A. 150 P.=106.9375 A. ;
 $\$96 \times 106.9375 = \$10266$, selling price;
 $\$10266 \div 1.18 = \$8700$, *Ans.*
- Ex. 12. $\$21.12 \times 36.840 = \$778.0608$, sold for;
 $\$778.0608 \div 1.28 = \$607.86$, cost;
 $\$17 \times 36.840 = \$626.28$, value at \$17 per M.;
 $\$626.28 - \$607.86 = \$18.42$ gain, *Ans.*
- Ex. 13. $1 - .04 = .96 = 96\%$, purchase price;
 $1 - .28 = .72 = 72\%$, selling “
 $96\% - 72\% = 24\%$, difference of prices;
 $.24 \div .96 = .25 = 25\%$, *Ans.*
- Ex. 14. $\$7050 \div .94 = \$7500$, cost;
 $\$7500 \times 1.12\frac{1}{2} = \$8437.50$, *Ans.*
- Ex. 15. $\$182 \div .875 = \$208$, cost of second;
 $\$208 \div 1.30 = \$160$, “ “ first
- Ex. 16. 15 % on $\frac{1}{4}$ is $\frac{1}{4}$ of 15 % = $3\frac{3}{4}\%$ on the whole
 $18\frac{3}{4}\%$ on $\frac{1}{3}$ is $\frac{1}{3}$ of $18\frac{3}{4}\%$ = $6\frac{1}{4}\%$ “ “ “
 20% on $\frac{1}{6}$ is $\frac{1}{6}$ of 20% = $3\frac{1}{3}\%$ “ “ “
 $33\frac{1}{3}\%$ on $\frac{1}{4}$ is $\frac{1}{4}$ of $33\frac{1}{3}\%$ = $8\frac{1}{4}\%$ “ “ “
- $21\frac{2}{3}\%$; rate of grain
- $\$6340 \times 21\frac{2}{3}\% = \$1482$, entire gain, *Ans.*

Ex. 17. 100 % cost ;
 $1.00 \times 1.50 = 150$ %, after 1 year ;
 $1.50 \times 1.50 = 225$ %, " 2 years ;
 $2.25 \times 1.50 = 337\frac{1}{2}$ %, " 3 "
 $3.375 \times 1.50 = 506\frac{1}{4}$ %, " 4 "
 $\$12000 \div 5.0625 = \$2370.37\frac{1}{2}$, Ans.

Ex. 18 $\$1.80 \times 600 = \$1080$ }
 $\$1.62\frac{1}{2} \times 1200 = \$1950$ } = \$3030
 $\$1.25 \times 200 = 250$

 $\$3280$, cost ;
 $\$3030 \times 1.20 = \$3636$, receipts from first two binds.
 $\$1.20 \times 200 = \$240$, " " third "

 $\$3876$, total receipts ;
 $\$3876 \times .05 = \$193.80$, commission ;
 $\$3876 - (\$193.80 + \$254.60) = \$3427.60$, proceeds ;
 $\$3427.60 - \$3280 = \$147.60$, gain ;
 $\$147.60 \div \$3280 = 4\frac{1}{2}$ %, Ans.

Ex. 19. $100\% - 20\% = 80\%$, buying price ;
 $100\% - 16\% = 84\%$, selling "

 $4\% \div 80\% = 5\%$, Ans

Ex. 20. Suppose he sells 1 share of \$100 ; then $\$100 \times .06$
 $= \$5.00$, annual income parted with ;
 $\$78 \div 1.04 = \$75$, stock purchased ;
 $\$75 \times .06 = \$4.50$; annual income in return ;
 $\$5.00 - \$4.50 = \$0.50$ " " " lost ;
 $\$.50 \div \$5.00 = .10 = 10\%$, Ans.

Ex. 21. $\$125 \times 12 = \$1500$, received for each half ;
 $\$1500 \div 1.25 = \$1200$, cost of one half ;
 $\$1500 \div .75 = \$2000$, " " the other half ;

$$\begin{aligned} \$1200 + \$2000 &= \$3200, \text{ cost of the whole;} \\ \$1500 \times 2 &= 3000, \text{ received for the whole;} \\ &\underline{\hspace{1.5cm}} \\ &\$ 200 \text{ lost, } \textit{Ans.} \end{aligned}$$

Ex. 22. $\$30 \times 1.20 = \$36$, selling price;
 $\$36 \div .75 = \$48$, asking price, *Ans.*

Ex. 23. He asked 120 % of the cost, and sold at $1.00 - .20 = .80$ % of the asking price. Hence $120 \times .80 = .96$; $1.00 - .96 = .04 = 4$ % loss, *Ans.*

Ex. 24. $\$.05 \times 216 \times 200 = \$2160$, cost of N. O. sugar;
 $\$.05\frac{3}{4} \times 200 \times 560 = 6440$, " " W. I. "
 $\hspace{1.5cm} \$8600$, entire cost;
 $\$2160 \times .99 = \$2138.40$, rec'd for N. O. sugar
 $\$6440 \times 1.00\frac{2}{3} = 6496$, " " W. I. "
 $\hspace{1.5cm} \$8634.40$, " " the whole;
 $\$8634.40 - \$8600 = \$34.40$, gain;
 $\$34.40 \div \$8600 = .004 = \frac{2}{5}$ % gain, *Ans.*

Ex. 25. $\$31.50 \div .70 = \$45$, prime cost of the whole;
 $\$45 \div 63 = \$.71\frac{2}{3}$, purchase price per gallon, *Ans.*

Ex. 26. $1.00 - .07\frac{2}{3} = .92\frac{2}{3} = .924$, selling price;
 $.924 \div 1.05 = .88$, purchase price;
 $1.00 - .88 = .12 = 12$ %, *Ans.*

Ex. 27. $\$.025 \div .08 = \$.31\frac{1}{4}$, *Ans.*

Ex. 28. $\$.75 \div .1875 = \$4.00$, cost;
 $\$4.00 \times .31\frac{1}{4} = \$1.25$, advance on cost;
 $\$1.25 - \$.75 = \$.50$, *Ans.*

Ex. 29 80 % of $\frac{2}{3} = .18$ of the whole;
 5 % of $\frac{2}{3} = .02$ " "
 $\hspace{1.5cm} \underline{\hspace{1.5cm}}$
 $\$.720 \div .16 = \$4500$, investment;

30 % of $\frac{2}{3} \div .12$, of the whole ;

5 % of $\frac{2}{3} = .03$, " "

$$\$4500 \times .09 = \$405, \text{ Ans}$$

- Ex. 30. His asking price was 136 % of the cost, and his selling price was 100 %—16 % = 84 % of his asking price, or $1.36 \times .84 = 1.1424 = 114\frac{24}{100}$ % of the cost. Hence the gain was $14\frac{24}{100}$ % of the cost; and $\$740.48 \div 1.1424 = \$5200$, the cost;
 $\$5200 \times 1.36 = \$7072$, the asking price;
 $\$5200 \times 1.1424 = \$5940.48$, sold for, *Ans*.

- Ex. 31. Since his gain on $\frac{2}{3}$ was $\frac{1}{3}$, we have $\frac{1}{3} \div \frac{2}{3} = .60 = 60$ %, the rate of gain, *Ans*.

- Ex. 32. $(\$375 \times 84 \times 4) + \$7.50 = \$133.50$, whole cost;
 $\$133.50 \times 1.25 = \$166.875$, net avails required;
 $\$166.875 \div .99 = \$168.56$, to cover the collector's fee;
 $\$168.56 \div .96 = \$175.58$, whole sum to be obtained to cover bad debts and collector's fee; but 84 gal. $\times 4 = 336$ gal. bought; 336 gal. $\times .05 = 16.8$ gal. leakage and waste; 336 gal.—16.8 gal. = 319.2 gal. left for sale. Hence, $\$175.58 \div 319.2 = \$55+$, *Ans*

INSURANCE.

FIRE AND MARINE INSURANCE

(503, page 291.)

- Ex. 3. $\$5860 \times .015 = \$87.90$, *Ans*.
 Ex. 4. $\$860 \times .005 = \$4.30$, *Ans*.
 Ex. 5. $\$3500 \times .01\frac{1}{4} = \$43.75$, *Ans*.

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- Ex. 6. $\$10000 \times .0225 = \$225$, premium;
 $\$10000 - \$225 = \$9775$, *Ans.*
- Ex. 7. $\$6000 \times .01\frac{1}{4} = \$75$, premium,
 $\$6000 - (\$75 + \$5.50) = \$5919.50$ covered;
 $\$10000 - \$5919.50 = \$4080.50$, *Ans.*
- Ex. 8. $\$12000 \times \frac{1}{4} = \$9600$, policy;
 $\$9600 \times .00\frac{3}{4} = \$72$, premium;
 $\$9600 - \$72 = \$9528$, covered by insurance;
 $\$12000 - \$2000 = \$10000$, whole loss;
 $\$10000 - \$9528 = \$472$, owner's loss, *Ans.*
- Ex. 9. $\$36000 \times .02\frac{1}{2} = \$900$, premium received;
 $\$18000 \times .03 = 540$, " paid out;
 $\$360$, *Ans.*
- Ex. 10. $\$12 \div \$800 = .015 = 1\frac{1}{2} \%$, *Ans.*
- Ex. 11. $\$107.25 \div .0325 = \$3300$, policy;
 $\$3300 \div .80 = \$4125$, cost of wheat;
 $\$4125 \div 500 = \$8.25$, price per barrel, *Ans.*
- Ex. 12. $\$280 \div \$16000 = .0175 = 1\frac{3}{4} \%$, *Ans.*
- Ex. 13. $\$20000 \times .00\frac{3}{4} = \$150$
 $30000 \times .00\frac{1}{2} = 150$
 $\$50000 \quad \$300 \div \$50000 = .006 = \frac{3}{5} \%$, *Ans.*
- Ex. 14. $\$46.75 \div .01375 = \$3400$, policy;
 $\$3400 \times 2 = \$6800$, *Ans.*
- Ex. 15. $1 - .01125 = .98875$; $\$7910 \div .98875 = \$8000$, *Ans.*
- Ex. 16. $1 - .02\frac{3}{4} = .97\frac{1}{4}$; $\$27320 \div .97\frac{1}{4} = \$28000$, policy
 $\$28000 - \$27320 = \$680$, *Ans.*
- Ex. 17. $\$122.50 \div .04\frac{3}{8} = \$1400$, policy;
 $\$1400 \div \frac{5}{8} = \$1120$, *Ans.*

Ex. 18. On each \$1 which the house is worth, he obtains an insurance of \$.75, for which he pays during the 5 years, $$.75 \times .015 \times 5 = $.05625$; hence the insurance will cover $$.75 - $.05625 = $.69375$; and his loss on the \$1 will be $$1 - $.69375 = $.30625$; therefore, $$.2940 \div .30725 = 9600 , *Ans.*

Ex. 19. $1.00 \div .025 = 40$ years, *Ans.*

Ex. 20. $.025 \times \frac{3}{8} = .015$, the per cent. of the policy paid for re-insuring; hence $.0225 - .015 = .0075$;
and $$.72 \div .0075 = 9600 , *Ans.*

Ex. 21. The two companies together must lose $1 - .0425 = .9575$ of the policy; and since the Manhattan Company becomes responsible for .50 of the policy, and receives $.50 \times .03 = .015$ of the policy in premium, it must lose $.50 - .015 = .485$ of the policy; therefore, the Commercial Insurance Company will lose $.9575 - .485 = .4725$ of the policy; and consequently $.485 - .4725 = .0125$ of the policy is \$1350; hence $$1350 \div .0125 = 108000 , the policy;
 $$108000 \div \frac{3}{4} = 144000 , value ship and cargo;
 $$108000 \times .9575 = 103410$, covered by insurance

\$40590, Ans.

LIFE INSURANCE.

(509, page 293.)

Ex. 2. $$113.50 \times 21 = 2383.50 , amount paid;
 $$2383.50 \times .30 = 715.05 , dividend returned;
 $$2383.50 - $715.05 = 1668.45$, amount paid the Co.
 $$5000 - $1668.45 = 3331.55 , *Ans.*

Ex. 3. $$.50.11 \times 5 = 250.55 , *Ans.*

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- Ex. 4. $\$37.52 \times 4 = \$150.08 \times 25 = \$3752.00$, amount paid;
 $\$4000 + \$2400 = \$6400$, amount drawn;
 $\$6400 - \$3752 = \$2648.00$, *Ans.*
- Ex. 5. $\$72.14 \times 3 = \$216.42$, annual premium;
 $\$216.42 \times 13 = \$2813.46$, amount paid;
 $\$37.97 \times 3 = \$113.91$, annual premium life plan;
 $\$113.91 \times 13 = \$1480.83$, amt't required " "
 $\$2813.46 - \$1480.83 = \$1332.63$, *Ans.*
- Ex. 6. $\$553.33 \times 8 = \$4426.64$, amount paid;
 $\$127.74 \times 8 = \$1021.92$, annual premium for 5 years;
 $\$1021.92 \times 4 = \$4087.68$;
 $\$4426.64 - \$4087.68 = \$338.96$, *Ans.*
- Ex. 7. $\$10000 + \$7000 = \$17000$, amount drawn;
 $\$48.74 \times 10 = \$487.40$, annual premium;
 $\$487.40 \times 20 = \$9748.00$, amount paid;
 $\$487.40 \times .06 = \$29.244$, int. on each pay't per year;
 $20 + 19 + 18 + 17 + 16 + 15 + 14 + 13 + 12 + 11 + 10 + 9 + 8 + 7 + 6 + 5 + 4 + 3 + 2 + 1 = 210$ years;
 $\$29.244 \times 210 = \$6141.24$, interest;
 $\$9748 + \$6141.24 = \$15889.24$;
 $\$17000 - \$15889.24 = \$1110.76$, *Ans.*
- Ex. 8. $\$1000 \div \$19.89 = 50 +$, A's number of payments requiring 50 years; hence $25 + 50 = 75$, A's age;
 $\$1000 \div \$26.38 = 37 +$, B's number of payments, requiring 37 years; hence $35 + 37 = 72$, *Ans.*
- Ex. 9. $\$51.22 \times 6 = \$307.32$, annual payment;
 $\$6000 - \$4463.40 = \$1536.60$, amount paid;
 $\$1536.60 \div \$307.32 = 5$, *Ans.*
- Ex. 10. $\$31.30 \times 5 = \$156.50$, annual premium;
 $\$156.50 \times 4 = \$626.00$;
 $\$156.50 \div 2 = \$78.25 \times 26 = \$2034.50$;
 $\$626 + \$2034.50 = \$2660.50$, *Ans.*
- Ex. 11. $\$175.50 \times 45.995 = \$8072.12$, amount paid the Company with compound interest at 6 per cent. ;
 $\$8637.34 - \$8072.12 = \$565.22$, *Ans.*

TAXES.

(514, page 300.)

Ex. 2.	Tax on \$8000	is	\$32.00
	" " 500	"	2.00
	" " 30	"	.12
	" " 3 polls	"	1.50

\$35.62, *Ans.*

Ex. 3	Tax on \$900	is	\$3.60
	" " 80	"	.32
	" " 7	"	.028
	" " 1 poll	"	.50

\$4.448, *Ans.*

- Ex. 4. $\$.25 \times 2156 = \$539$, amount of poll tax,
 $\$6319 - (\$654 + \$539) = \$5126$, property tax,
 $\$5126 \div \$1864000 = .00275$, rate of taxation for town
 purposes; $.00275 + .0015 + .0005 = .00475$, full rate;
 $\$32560 \times .00475 = \$154.66$, A's property tax;
 $\$.25 \times 3 = .75$, " poll tax;

\$155.41, *Ans.*

- Ex. 5. $\$16840 \times .00475 = \$79.99$, *Ans.*

- Ex. 6. $\$5561.50 \div .98 = \$5675$, *Ans.*

- Ex. 7. $\$9120 \div .95 = \$9600$, tax to be raised;
 $\$9600 \div \$1536000 = .00625 = \frac{5}{8} \%$, *Ans.*

- Ex. 8. $\$1200 + \$57.65 + \$38.25 = \$1295.90$, whole expense
 $\$1295.90 - \$257.75 = \$1038.15$, tax by rate-bill;
 $\$1038.15 \div 9568 = \$.108502$, rate per day;
 $\$.108502 \times 46 \times 4 = \$19.96$, *Ans.*

- Ex. 9. $\$1260.52 \div .965 = \$1306.24$, tax to be assessed,
 $\$1306.24 \div .00325 = \$401920$, base of taxation, or
 valuation of property, *Ans.*

(300)

GENERAL AVERAGE.

(518, page 302.)

Ex. 1.	Losses.	Contributory Interests.
	Jettson, \$6300	Vessel, \$25000
	Repairs, less $\frac{1}{3}$, 1000	Freight, less $\frac{1}{3}$, 2800
	Cost of detention, 420	Cargo, 25200
	Total, \$7720	Total, \$53000
	$\$7720 \div \$53000 = .1456603 +$, rate of loss;	
	$\$25200 \times .1456603 = \$3670.64$, payable by Hayden & Co.;	
	\$6300 , receivable	" "
	\$2629.36, balance due	" "

Or,

$\$27800 \times .1456603 = \$4049.36$, payable by George Law;	
1420 , receivable	" "
\$2629.36, balance due	Hayden & Co.

Ex. 2.	Losses.	Contributory Interests
	Jettson, \$1570	Vessel, \$28000
	Repairs, less $\frac{1}{3}$, 180	Freight, less $\frac{1}{3}$, 1000
	Detention, 120	Cargo, 5000
	Total, \$1870	Total, \$34000
	$\$1870 \div \$34000 = .055$, rate of loss;	
	$\$29000 \times .055 = \$1595$, contributed by ship owners;	
	$\$180 + \$120 = 300$, due	" "
	\$1295, payable by	" "
	$\$750 \times .055 = \$41.25$	" " C;
	$\$2400 \times .055 = \$132$, contributed by A;	
	$\$1400 - \$132 = \$1268$, receivable	" "
	$\$1850 \times .055 = \$101.75$, contributed by B;	
	$\$170 - \$101.75 = \$68.25$, receivable	" "

CUSTOM HOUSE BUSINESS.

(529, page 365.)

Ex. 4. $\$2780 \times .04 = \$111.20$, *Ans.*

Ex. 5. $\$.055 \times 1200 = \$66$, cost; $\$66 \times .15 = \$9.90$, *Ans.*

Ex. 6. $112 \text{ lb.} \times 54 = 6048 \text{ lb.}$, gross weight, long ton measure;
 $6048 \text{ lb.} \times .035 = 211.68 \text{ lb.}$, tare;
 $6048 \text{ lb.} - 211.68 \text{ lb.} = 5836.32 \text{ lb.}$, net weight;
 $\$.0875 \times 5836.32 = \$510.678$, net value;
 $\$510.678 \times .15 = \$76.60$ +, *Ans.*

Ex. 7. $36 \text{ gal.} \times 50 = 1800 \text{ gal.}$, gross measure;
 $1800 \text{ gal.} \times .015 = 27 \text{ gal.}$, leakage;
 $1800 \text{ gal.} - 27 \text{ gal.} = 1773 \text{ gal.}$, net measure;
 $\$2.50 \times 1773 = \$4432.50$, net value;
 $\$4432.50 \times .30 = \$1329.75$, duty;
 $\$2.50 \times 1800 = 4500$ invoice;
 $\$1.30 \times 50 = 65$ freight;
 8.50 , cartage;

 $\$5903.25$, *Ans.*

Ex. 8. $120 \text{ doz.} \times .02 = 2.4 \text{ doz.}$, breakage;
 $120 \text{ doz.} - 2.4 \text{ doz.} = 117.6 \text{ doz.}$, net measure;
 $\$1.25 \times 117.6 = \$147$, net value;
 $\$147 \times .24 = \$35.28$, *Ans.*

Ex. 9. $\$619.40 \div .19 = \$3260$, *Ans.*

Ex. 10. $.05\frac{1}{4} \times 14 \times 600 = \$441$, invoice, base of duty;
 $\$35.28 \div \$441 = .08 = 8 \%$, *Ans.*

Ex. 11. $\$.30 \times 63 \times 200 = \$3780$
 $\$.05 \times 500 \times 150 = 3750$

 $\$7530 \times .24 = \$1807.20$
 $\$2.50 \times 80 = \$200$

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$$\$3.00 \times 75 = \$225$$

$$\$425 \times .08 =$$

$$34$$

$$\$1841.20, \text{ Ans.}$$

- Ex. 12. $36 \text{ gal.} \times 56 = 2016 \text{ gal.};$
 $\$907.20 \div .50 = \$3024, \text{ cost};$
 $\$3024 \div 2016 = \$1.50, \text{ Ans.}$
- Ex. 13. $\$132 \div .24 = \$550, \text{ on which duty was reckoned};$
 $\$550 \div .88 = \$625, \text{ Ans.}$
- Ex. 14. $\$1980.50 - \$12.24 = \$1968.26, \text{ invoice and duty};$
 $\$1968.26 - \$1654 = \$314.26, \text{ duty};$
 $\$314.26 \div \$1654 = .19 = 19 \%, \text{ Ans.}$
- Ex. 15. $\$823.20 \div .24 = \$3430, \text{ net value};$
 $\$3430 \div \$.25 = 13720 = 1143\frac{1}{3} \text{ doz., Ans.}$

SIMPLE INTEREST.

(540, page 311.)

- | | |
|---|---|
| Ex. 3. <i>Ans.</i> \$.921. | Ex. 4. <i>Ans.</i> \$5.885+. |
| Ex. 6. <i>Ans.</i> \$178.94—. | Ex. 8. <i>Ans.</i> \$770. |
| Ex. 12. <i>Ans.</i> \$2.80. | Ex. 14. <i>Ans.</i> \$195.765+ |
| Ex. 15. <i>Ans.</i> \$12.06+. | Ex. 16. <i>Ans.</i> \$46.875. |
| Ex. 18. <i>Ans.</i> \$160.625. | Ex. 20. <i>Ans.</i> \$28.34+. |
| Ex. 23. <i>Ans.</i> \$24.18+. | Ex. 24. <i>Ans.</i> \$72.96. |
| Ex. 29. <i>Ans.</i> \$40.83 $\frac{1}{3}$. | Ex. 30. <i>Ans.</i> \$11.69+. |
| Ex. 31. <i>Ans.</i> \$13.88+. | Ex. 33. <i>Ans.</i> \$2.43—. |
| Ex. 34. <i>Ans.</i> \$26.70+. | Ex. 39. <i>Ans.</i> \$5019.44 $\frac{1}{2}$. |
| Ex. 41. Time, 2 yr. 7 mo. 13 da.; \$2078.87—, <i>Ans.</i> | |
| Ex. 42. Time, 7 yr. 8 mo. 16 da.; \$4615.43+, <i>Ans.</i> | |

Ex. 43. Time, 2 yr. 4 mo. 15 da.; \$12.86+, *Ans.*

Ex. 44. 21 yr.—15 yr. 3 mo. 20 da.=5 yr. 8 mo. 10 da.;
\$3754.45+int. for 5 yr. 8 mo. 10 da.
=\$5037.22+, *Ans.*

Ex. 45. He gains the difference between the legal rates of
interest in the two places, which is 1 % on \$7500;
hence, $\$7500 \times .01 = \$75$, *Ans.*

Ex. 46. Cash, \$3200
\$3500+int. for 6 mo.= 3622.50
\$2500+ “ “ 10 “ = 2645.83 $\frac{1}{3}$
\$2120+ “ “ 15 “ = 2305.50

Ans. \$11773.83 $\frac{1}{3}$

Ex. 47. \$6840+int. from May 10, 1859, to June 21, 1860,
=\$7297.14, the cost of the flour;
\$6840÷\$5.70=1200 barrels purchased;
\$6.625×1200=\$7950 receipts;
\$7950—\$7297.14=\$652.86, *Ans.*

Ex. 48.
As he pays 7 % per year of 360 days, and, by agreement,
receives 6 % per year of 365 days,
The int. in N. Y. = $\frac{14}{360} = \frac{73}{180}$ of a year's int.,
And the int. in O. = $\frac{14}{365} = \frac{2}{5}$ of a year's int.
Hence, he pays $\$15000 \times \frac{7}{100} \times \frac{73}{180} = \$425.83\frac{1}{3}$,
He receives $\$15000 \times \frac{6}{100} \times \frac{2}{5} = \$360.00$,
And he loses $\$65.83\frac{1}{3}$. *Ans.*

Ex 49. \$1250+ interest for 7 mo. 16 da.= \$1304.93
\$3540.84+ “ “ 4 “ 27 “ = 3642.049
\$ 575+ “ “ 3 “ = 585.062
\$816.90+ “ “ 1 “ 7 “ = 822.777

Ans. \$6354.818+

Ex. 50. $33 \times 11 = 363$ da., whole time for which he rec'd int.;
 $.363 \div 6 = \$.0605$, interest on \$1 at 6 %;
 $\$.0605 \times 4 = \$.242$, " " " " 2 % a month;
 $\$.242 - \$.06 = \$.182$, interest gained on \$1;
 $\$.182 \times 1000 = \$182$, *Ans.*

Ex. 51. He gained at the rate of $12\frac{1}{2}\%$ — $7\frac{3}{4}\%$ — $4\frac{3}{4}\%$
 per annum, for 2 yr. 5 mo. 10 da. = $2\frac{2}{3}$ yr.; hence
 $\$21840 \times .04\frac{2}{3} \times 2\frac{2}{3} = \$2535.86\frac{2}{3}$, *Ans.*

Ex. 52. $\$27.50 \times 450 = \$12375$, money borrowed;
 $\$12375 +$ int. for 4 yr. 11 mo. 20 da. = $\$15759.22$,
 outlay; $\$34 \times 180 = \$6120$
 $\$32.55 \times 270 = 8788.50$ returns, 14908.50 ;
Ans., \$850.72.

Ex. 53. $\$1.12\frac{1}{2} \times 4500 = \$5062.50$, cost;
 $\$1.06 \times 4500 = \$4770$, wheat sold for;
 $\$4770 \times .05 = \$238.50$, interest;
 $\$4770 + \$238.50 = \$5008.50$, total returns;
 $\$5062.50 - \$5008.50 = \$54$, loss, *Ans.*

PARTIAL PAYMENTS.

(543, page 312.)

Ex. 2.

Amount of note, Oct. 15, 1860, (1 yr.),	\$1272.00
Payment,	1000.00
New principal,	\$272.00
Amount, April 15, 1861, (6 mo.),	280.16
Payment,	200.00
New principal,	\$80.16
Amount, Oct. 15, 1861, (6 mo.),	82.56+, <i>Ans</i>

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Ex. 3.

Amt. of note, Mar. 4, 1856, (8 mo. 24 da.), \$888.19+

Payment, 210.98

New principal, \$667.26+

Am't, July 9, 1857, (1 yr. 1 mo. 5 da.), 732.01+

Payment, 140.00

New principal, \$592.01+

Amount, Feb. 20, 1858, (7 mo. 11 da.), 613.81+

Payment, 178.00

New principal, \$435.81+

Am't, May 5, 1859, (1 yr. 2 mo. 15 da.), 467.41+

Payment, 154.30

New principal, \$313.11+

Amount, Jan. 17, 1860, (8 mo. 12 da.), 326.26+

Payment, 259.45

New principal, \$66.81

Am't, Oct. 24, 1861, (1 yr. 9 mo. 7 da.), 73.90+, Am

Ex. 4.

Amt. note, Oct. 20, 1861, (1 yr. 1 mo. 16 da.), \$415.34+

Payment, 126.50

New principal, \$288.84

Amount, Jan. 1, 1862, (2 mo. 11 da.), 292.83--, Am

Ex. 5.

Amt. of note, June 1, 1857, (2 mo. 25 da.), \$3516.02+

Payment, 1247.60

New principal, \$2268.42+

Amount, Sept. 10, 1857, (3 mo. 9 da.), 2299.61+

Payment, 1400.00

New principal,	\$899.61+
Amount, Jan. 31, 1858, (4 mo. 21 da.),	917.23+, <i>Ans</i>
Ex. 6.	
Mortgage,	\$9750.00
Payment, Oct. 1, 1860,	846.50
Due, Jan. 1, 1861, (9 mo. from date),	\$8903.50
Amt., Oct. 20, 1862, (1 yr. 9 mo. 19 da.),	10508.60+
Payment,	2500.00
New principal,	\$8008.60+
Amount, July 3, 1863, (8 mo. 13 da.),	8571.43 -
Payment,	1500.00
New principal,	\$7071.43—
Amount, Jan. 1, 1864, (5 mo. 28 da.),	7421.06 +
Payment,	500.00
New principal,	\$6921.06 +
Amount, Apr. 1, 1865, (1 yr. 3 mo.),	7786.19+, <i>Ans</i>
Ex. 7.	
Amount of note, May 1, 1861, (3 mo.),	\$507.50
Payment,	40.00
New principal,	\$467.50
Amount, May 1, 1862, (1 yr.),	495.55
Sum of payments, \$8+\$12+\$30=	50.00
New principal,	\$445.55
Amt., Sept. 16, 1862, (4 mo. 15 da.),	455.57+, <i>Ans</i>

(546, page 314.)

Ex. 1.

Amount, Apr. 1, 1857, (1 yr. 2 mo.),	\$1070
1st payment,	80

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New principal,	\$ 990
Amt., Apr. 1, 1858, (1 yr.),	1049.40
Amt. of 2d payment to date, (8 mo.),	31.20
New principal,	\$1018.20
Amt., Dec. 1, 1858, (8 mo.),	1058.93—
Sum of 3d and 4th payments,	610.00
New principal,	\$448.93—
Amt., Oct. 1, 1859, (10 mo.),	471.38—
Amt. of 5th payment, to date, (5 mo.),	205.00
	\$ 266.38—, <i>Ans.</i>

Ex. 2.

Amt. of principal, Jan. 10, 1863, (4 yr. 8 mo.),	\$2560
Amt. of 1st indorsement, (3 yr. 10 mo.),	\$ 984
“ “ 2d “ (2 yr. 8 mo.),	464
“ “ 3d “ (1 yr. 4 mo.),	324
	\$ 788, <i>Ans.</i>

Ex. 3.

Amount, May 10, 1859, (1 yr.),	\$2120
Am't of 1st payment from Mar. 10 to May 10, 1859, (2 mo.),	808
New principal,	\$1312
Am't, May 10, 1860, (1 yr.),	1390.72
2d payment,	400.00
New principal,	\$990.72
Am't, Sept. 10, 1861, (1 yr. 4 mo.),	1069.98+
3d payment,	300.00
New principal,	\$769.98+
Am't, Jan. 10, 1863, (1 yr. 4 mo.),	831.58+, <i>Ans.</i>
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*By the New Hampshire Rule.***Ex. 4**

Am't of note, May 10, 1859, (1 yr.),	\$2120
Am't of 1st payment, to date, (2 mo.),	808
New principal,	\$1312
Am't, May 10, 1860, (1 yr.),	1390.72
2d payment,	400
New principal,	\$990.72
Am't, May 10, 1861, (1 yr.),	1050.16+
Am't, May 10, 1862, (1 yr.),	1113.17+
Am't of 3d payment, (8 mo.),	312.00
New principal,	\$801.17+
Am't, Jan. 10, 1863, (8 mo.)	833.21+, Ans

By the United States Rule.

Am't, Mar. 10, 1859, (10 mo.),	\$2100
Payment,	800
New principal,	\$1300
Am't, May 10, 1860, (1 yr. 2 mo.),	1391
Payment,	400
New principal,	\$991
Am't, Sept. 10, 1861, (1 yr. 4 mo.),	1070.28
Payment,	300
New principal,	\$770.28
Am't, Jan. 10, 1863, (1 yr. 4 mo.),	831.90+, Ans

SAVINGS BANK ACCOUNTS.

(549, page 320.)

Ex. 2.

Sum of deposits, Jan. 20,	\$26.80
Draft, Jan. 28,	5
Balance, Feb. 1,	\$21.80
Draft, Feb. 7,	8.48
Least balance during current month,	\$13.32
Sum of deposits, Feb. 20 and 27,	24.85
Int. on \$13.32 for 1 mo.,	.07
Balance, Mar. 1,	\$38.24
Deposit, Mar. 6,	14.65
	\$52.89
Draft, Mar. 20,	10
	\$42.89
Deposit, Mar. 29,	7.98
Int. on \$38.24, (least bal.) for 1 mo.,	.19
Balance, Apr. 1,	\$51.06
Draft, April 11,	12.76
	\$38.30
Deposit, April 25,	3.49
Int. on \$38.30 (least bal.) for 1 mo.,	.19
Balance, May 1,	\$41.98
Sum of deposits during May,	72.29
Int. on \$41.98, (least bal.) for 1 mo.,	.21

SAVINGS BANK ACCOUNTS.

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Balance, June 1,	\$114.48
Sum of drafts during June,	31.92
	\$82.56
Int. on \$82.56 (least bal.) for 1 mo.,	.41
Balance, July 1,	\$82.97
Deposit, July 28,	15.68
Int. on \$82.97 (least bal.) for 1 mo.,	.41
Balance, Aug. 1,	\$99.06
Deposit, Aug. 3,	18.45
	\$117.51
Draft, Aug. 17,	5.64
	\$111.87
Deposit, Aug. 26,	4.50
Int. on \$99.06 (least bal.) for 1 mo.,	.50
Balance, Sept. 1, 1860,	\$116.87, Ans
Ex. 3.	
Balance, Jan. 1, 1859,	\$ 47.50
Deposit, March 12, 1859,	124.36
Int. on \$47.50 for 3 mo.,	.83
Balance, April 1, 1859,	\$172.69
Draft, May 12, 1859,	50.36
	\$122.33
Deposit, June 20, 1859,	130.56
Int. on \$122.33 (least bal.) for 3 mo.,	2.14
Balance, July 1, 1859,	\$255.03
Deposit, Aug. 3, 1859,	68.75
Int. on \$255.03 (least bal.) for 3 mo.,	4 48

Balance, Oct. 1, 1859,	\$328.24
Sum of drafts, Oct., Nov., and Dec., 1859,	74.76
	\$253.48
Int. on \$253.48 (least bal.) for 3 mo.,	4.43
Balance, Jan. 1, 1860,	\$257.91
Deposit, Jan. 25, 1860,	160.80
Int. on \$257.91 (least bal.) for 3 mo.,	4.51
Balance, April 1 or 4, 1860,	\$423.22, Ans
Ex. 4.	
Balance, July 1, 1858,	\$175
Draft, Sept. 14, 1858,	65
	\$110
Deposit, Nov. 1, 1858,	150
Int. on \$110 (least bal.) for 6 mo.,	3.30
Balance, Jan. 1, 1859,	\$263.30
Deposit, Feb. 24, 1859,	200
Int. on \$263.30 (least bal.) for 6 mo.	7.90
Balance, July 1, 1859,	\$471.20
Draft, July 25, 1859,	120
	\$351.20
Deposit, Sept. 10, 1859,	56
	\$407.20
Draft, Dec 3, 1859,	80
	\$327.20
Int. on \$327.20 (least bal.) for 6 mo.,	9.82
	\$337.02, Ans
(320, 321)	

Ex. 5.

Deposit, Jan. 1, 1858,		\$36.50
Int. on the same for 6 mo.,		.91
Deposit, Mar. 17, 1858,		25.38
Int. on the same for 3 mo.,		.32
Balance, July 1, 1858,		\$63.11
Deposit, Aug. 1, 1858,	\$84.72	
Draft, Sept. 16, 1858,	36.16	
		48.56
Int. on \$63.60 for 6 mo.,		1.58
" " \$48.56 " 3 "		.61
Balance, Jan. 1, 1859,		\$113.86
Draft, Jan. 27, 1859,	\$13.48	
" Mar. 1, "	17.50	
		30.98
		\$82.88
Deposit, June 11, 1859,		50
Int. on \$84.26 (least bal.) for 6 mo.,		2.07
Balance, July 1, 1859,		\$134.95
Deposit, Nov. 16, 1859,		40.78
Int. on \$137.21 (least bal.) for 6 mo.,		3.87
Balance Jan. 1, 1860,		\$179.10, Ans

COMPOUND INTEREST.

(550, page 322.)

Ex. 1.	\$750	Principal for 1st year;
	$\$750 \times 1.06 =$	795 " " 2d "
	$\$795 \times 1.06 =$	842.70 " " 3d "
	$\$842.70 \times 1.06 =$	893.26 " " 4th "
	$\$893.26 \times 1.06 =$	946.86 Amount " 4 years;
		750 Principal;

Ans. \$196.86—, Compound interest.

Ex. 2.	\$250	Principal for 1st year;
	$\$250 \times 1.07 =$	267.50 " " 2d "
	$\$267.50 \times 1.07 =$	286.23 " " 3d "
	$\$286.23 \times 1.07 =$	306.26+, <i>Ans.</i>

Ex. 3.	\$1475.50	Principal 1st half year;
	$\$1475.50 \times 1.035 =$	\$1527.15 " 2d "
	$\$1527.15 \times 1.035 =$	1580.60 " 3d "
	$\$1580.60 \times 1.035 =$	1635.92 " 4th "
	$\$1635.92 \times 1.035 =$	1693.18 " 5th "
	$\$1693.18 \times 1.035 =$	1752.43+, <i>Ans.</i>

Ex. 4.	\$376	Principal for 1st year;
	$\$376 \times 1.06 =$	398.56 " " 2d "
	$\$398.56 \times 1.06 =$	422.47 " " 3d "
	$\$422.47 \times 1.06 =$	447.81 Prin. for 8 mo. 15 da.;
	$\$447.81 \times 1.0425 =$	466.84 Amt. 3 yr. 8 mo. 15 da.;
		376
		\$ 90.84+, <i>Ans.</i>

(551, page 320.)

Ex 2 $\$536.75 \times 2.51817 = \$1351.63—, \text{Ans.}$

(318—324)

- Ex. 3.** There will be 5 half years and 3 mo. 12 days over;
 $\$.019\frac{5}{8}$, simple interest of \$1 for 3 mo. 12 da.;
 $\$.194\frac{1}{2}$ " " " " " 2 yr. 9 mo. 12 da.,
 $\$1275 \times 1.187686 = \$1514.299 +$, amt. of the given
 sum at $3\frac{1}{2}\%$ per half year, for 2 yr. 6 mo.;
 $\$1514.299 \times 1.019\frac{5}{8} = \$1544.332 +$, amt. for 2 yr.
 9 mo. 12 da.;
 $\$1544.331 \div 1.194\frac{5}{8} = \$1292.51 -$, *Ans.*
- Ex. 4.** There will be 7 interest terms of 3 mo. each, and 1
 partial term of 1 mo. 20 da.; hence,
 $\$1840 \times (1.02)^7 \times 1.01\frac{1}{3} = \$2137.06 +$, *Ans.*
- Ex. 5.** 21 yr.—12 yr. 7 mo. 12 da. = 8 yr. 4 mo. 18 da.;
 $\$15000 \times 1.733986 = \$26009.79$, amt. for 8 yr.;
 697.93, int. for 4 mo. 18 da.;

 $\$26707.72$, *Ans.*
- Ex. 6** Since \$1 will amount to \$3.869685, the sum which
 will amount to \$2902.263 in the same time is
 $\$2902.263 \div 3.869685 = \$750$, *Ans.*

(552, page 325.)

- Ex. 1.** Int. of \$1 for 1 yr. 6 mo. is \$.0975;
 $\$279.825 \div .0975 = \$2870$, *Ans.*
- Ex. 2.** Int. of \$1 for 6 mo. 24 da. is \$.0425;
 $\$63.75 \div .0425 = \$1500$, *Ans.*
- Ex. 3.** Int. of \$1 for 10 da. is \$.0027 = $\$.002\frac{7}{10}$;
 $\$12\frac{1}{2} \div \frac{27}{10000} = \$4500$, *Ans.*
- Ex. 4.** $\$3125 \div .125 = \$25000$, *Ans.*
 (324, 325)

- Ex. 5. $\$30 \times 12 = \$360$, yearly income;
 $\$360 \div .095 = \$3789.47 +$, *Ans.*
- Ex. 6 Int. of \$1 for 6 yr. 5 mo. 11 da. is $\$.451\frac{1}{3}$;
 $\$3159.14 \div .451\frac{1}{3} = \$7000$, *Ans.*
- Ex. 7 The compound interest of \$1 for 2 yr. 9 mo. is
 $\$.174162$; $\$69.67 \div .174162 = \$400 +$, *Ans.*
- Ex. 8. The compound interest of \$1 for 1 yr. 6 mo. 15 da. is
 $\$.09445$; $\$124.1624 \div .09445 = \$1314.583 +$, *Ans.*

(553, page 326.)

- Ex. 1. The amount of \$1 for 2 yr. 3 mo. 10 da. is $\$1.113\frac{1}{3}$;
 $\$1893.61\frac{1}{3} \div 1.113\frac{1}{3} = \$1700$, *Ans.*
- Ex. 2. The amount of \$1 for 3 yr. 5 mo. 12 da. is $\$1.207$;
 $\$681.448 \div 1.207 = \$564.58 -$, *Ans.*
- Ex. 3. The amount of \$1 for 10 yr. 2 mo. is $\$1.35\frac{7}{12}$;
 $\$15660 \div 1.35\frac{7}{12} = \$11550.09 +$, *Ans.*
- Ex. 4. The amount of \$1 for 2 yr. 8 mo. 29 da.
 is $\$1.1923055 +$;
 $\$1568.97 \div 1.1923055 = \$1315.913 -$, sum at int.;
 $\$1568.97 - \$1315.913 = \$253.057 +$, *Ans.*
- Ex. 5. The amount of \$1 for 243 da. is $\$1.054$;
 $\$11119.70 \div 1.054 = \$10550$, sum at interest;
 $\$11119.70 - \$10550 = \$569.70$, *Ans.*
- Ex. 6. The amount of \$1 at compound interest for 4 yr. is
 $\$1.262477$; $\$8644.62 \div 1.262477 = \$6847.34 +$.
- Ex. 7. Amount of \$1 for 10 yr. 5 mo. is $\$1.835619$;
 $\$26772.96 \div 1.835619 = \$14585.24 +$, *Ans.*

(325, 326)

(554, page 327.)

- Ex. 1.** \$9.375, interest on \$750 at 1 % ;
 $\$796.875 - \$750 = \$46.875$, whole interest ;
 $\$46.875 \div \$9.375 = 5$ %, *Ans.*
- Ex. 2.** $\$1.32\frac{2}{3}$, interest on \$1700 at 1 % ;
 $\$10.58 \div \$1.32\frac{2}{3} = 8$ + %, *Ans.*
- Ex. 3.** \$57, interest on \$600 at 1 % ;
 $\$856.50 - \$600 = \$256.50$, whole interest ;
 $\$256.50 \div \$57 = 4\frac{1}{2}$ %, *Ans.*
- Ex. 4.** \$72.6628, income at 1 % ;
 $\$744.7937 \div \$72.6628 = 10\frac{1}{4}$ %, *Ans.*
- Ex. 5.** By investing \$100—\$30=\$70, he will receive annually $\$4 + \$4 = \$8$; and $\$8 \div \$70 = 11\frac{1}{3}$ %, *Ans.*
- Ex. 6.** Since \$100 at 1 % will gain \$4, \$6, \$8, and \$10, in 4, 6, 8 and 10 years respectively, to gain \$100 will require $100 \div 4 = 25$ %, for 4 years ;
 $100 \div 6 = 16\frac{2}{3}$ %, “ 6 “
 $100 \div 8 = 12\frac{1}{2}$ %, “ 8 “
 $100 \div 10 = 10$ %, “ 10 “
- Ex. 7.** Since to triple itself the interest must be twice the principal, any sum, as \$100, will triple itself in
 2 years, at $200 \div 2 = 100$ % ;
 5 “ “ $200 \div 5 = 40$ % ;
 7 “ “ $200 \div 7 = 28\frac{4}{7}$ % ;
 12 “ “ $200 \div 12 = 16\frac{2}{3}$ % ;
 20 “ “ $200 \div 20 = 10$ %.
- Ex. 8.** $\$760.50 \div \$7800 = 9\frac{3}{4}$ %, *Ans.*
- Ex. 9.** $\$223 \times 12 = \$2676$, yearly income ;
 $\$2676 \div \$35680 = 7\frac{1}{2}$ %, *Ans.*

(555, page 328.)

- Ex. 1.** $\$273.51 \times .07 = \$19.1457$, interest for 1 yr.;
 $\$312.864 - \$273.51 = \$39.354$, whole interest;
 $\$39.354 \div \$19.1457 = 2.0555 + \text{yr.} = 2 \text{ yr. } 20 \text{ da.}$
- Ex. 2.** $\$650.82 \times .05 = \$32.541$, interest for 1 yr.;
 $\$761.44 - \$650.82 = \$110.62$, whole interest;
 $\$110.62 \div \$32.541 = 3.3994 + \text{yr.}$
 $= 3 \text{ yr. } 4 \text{ mo. } 24 \text{ da.}, \text{ Ans.}$
- Ex. 3.** Since \$100 at 3 %, $4\frac{1}{2}$ %, 6 %, 7 % and 10 % will gain \$3, $\$4\frac{1}{2}$, \$6, \$7 and \$10, respectively, in a year, a sum will double itself in
 $100 \div 3 = 33\frac{1}{3} \text{ yr. at } 3 \text{ \%}; 100 \div 4\frac{1}{2} = 22\frac{2}{3} \text{ yr. at } 4\frac{1}{2} \text{ \%};$
 $100 \div 6 = 16\frac{2}{3} \text{ yr. at } 6 \text{ \%}; 100 \div 7 = 14\frac{2}{7} \text{ yr. at } 7 \text{ \%};$
 $100 \div 10 = 10 \text{ yr. at } 10 \text{ \%}.$
 And quadruple itself in $300 \div 3 = 100 \text{ yr. at } 3 \text{ \%};$
 $300 \div 4\frac{1}{2} = 66\frac{2}{3} \text{ yr. at } 4\frac{1}{2} \text{ \%}; 300 \div 6 = 50 \text{ yr. at } 6 \text{ \%};$
 $300 \div 7 = 42\frac{6}{7} \text{ yr. at } 7 \text{ \%}; 300 \div 10 = 30 \text{ yr. at } 10 \text{ \%}.$
- Ex. 4.** $\$9750 \times .02 = \$195$, interest for 1 month;
 $\$780 \div \$195 = 4 \text{ mo.}, \text{ Ans.}$
- Ex. 6.** $\$376.76 \div 333 = \$1.131414 + \text{amt. of } \$1$; and, referring to the table under $2\frac{1}{2}$ %, we find that \$1 will amount to this sum (very nearly) in 5 terms of interest, or $2\frac{1}{2}$ years, *Ans.*
- Ex. 7.** We find by the table that it will require 11 years for \$1 at 6 % to gain \$.898299; and $\$1 - \$.898299 = \$.101701$, the interest still to be gained. $\$.1898209 \times .06 = \$.113898$, int. on last amount for 1 year. $\$.101701 \div \$.113898 = .8929 \text{ yr.} = 10 \text{ mo. } 21 + \text{da.}$
 Hence, any sum will double itself at 6 % compound interest, in 11 yr. 10 mo. 21 da.
 Again, \$1 at 7 % compound interest will gain

$\$.967151$ in 10 yr.; and $\$1 - \$.967151 = \$.032849$,
 the interest still to be gained; $\$1.967151 \times .07$
 $= \$.137701$ int., of last amount for 1 year; $\$.032849$
 $\div \$.137701 = .23858$ yr. = 2 mo. 26—da.

Hence, 10 yr. 2 mo. 26 da., *Ans.*

DISCOUNT.

(557, page 329.)

Ex 1. $\$1.0275$, amount of $\$1$ for 5 mo. 15 da.;

$\$385.3125 \div 1.0275 = \$375$, *Ans.*

Ex 2. $\$1.0826527 +$, amount of $\$1$ for 1 yr. 6 mo. 1 da.;

$\$429.986 \div 1.0826527 = \$397.160 -$, present worth.

$\$429.986 - \$397.16 = \$32.826$, *Ans.*

Ex. 3. $\$1.12$, amount of $\$1$ for 1 yr. 6 mo.;

$\$3665.20 \div 1.12 = \$3272.50$, cash value of sale;

$\$3272.50 - \$2964.12 = \$308.38$, *Ans.*

Ex. 4. $\$12000 \div 1.05 = \$11428.57 +$

$\$15000 \div 1.125 = \$13333.33 +$

Latter offer, $\$24761.90 +$, cash value;

$\$25000 - \$24761.90 = \$238.10$ gained, *Ans.*

Ex. 5. From Apr. 1, 1860, to Sept. 4, 1860, is 5 mo. 3 da.

“ “ “ “ “ Jan. 1, 1861, “ 9 mo.;

Discounting $\$1470$ for 5 mo. 3 da. at 10 %, and

$\$2816.80$ for 9 mo. at 10 %, we have

$\$1470 \div 1.0425 = \$1410.07 +$ borrowed, payable

Sept. 4, 1860; $\$2816.80 \div 1.075 = \$2620.28 +$,

borrowed, payable Jan. 1, 1861;

(328, 329)

$$\begin{aligned} \$1410.07 + 2620.28 &= \$4030.35, \text{ whole loan;} \\ \text{Am't of } \$1410.07 @ 7\%, \text{ Sept. 4, 1860, } & \$1452.02 \\ \text{“ “ } 2620.28 \text{ “ “ Jan. 1, 1861, } & 2757.84 \end{aligned}$$

Money borrowed, with interest, $\$4209.86$
 $\$1470 + \$2816.80 = \$4286.80$, money to be paid, if
 the house and lot were bought on credit; hence,
 $\$4286.80 - \$4209.86 = \$76.94$, gain by borrowing
 money to pay down.

Ex. 6 $\$576 \div 1.08 = \$533.33\frac{1}{3}$
 $\$576 - \$533.33\frac{1}{3} = \$42.66\frac{2}{3}$, discount;
 $\$576 \times .08 = \$46.08$, interest;

Difference, $\$3.41\frac{1}{3}$, *Ans.*

Ex. 7. The term of discount for the first sum is 6 mo. 23 da., and for the second, 11 mo. 14 da.; hence,
 $\$243.16 \div 1.039861 = \$233.843 +$
 $\$178.64 \div 1.066888 = 167.444 +$

 $\$401.287 +$, *Ans.*

Ex. 8. $\$.09 \times 488 \times 120 = \$5270.40$, cost;
 $\$5270.40 \div 1.06 = \$4972.07 +$, pres. worth of note;
 $\$6441.60 - \$4972.07 = \$1469.53 -$, *Ans.*

Ex. 9. $\$6.25 \div 1.04 = \$6.009 +$, present worth of \$6.25;
 $\$6.50 \div 1.06 = 6.132 +$, “ “ “ \$6.50;

Ans. $\$.123 +$, difference in favor of \$6.25

Ex. 10. 5 % per annum is $3\frac{1}{3}\%$ for 8 mo.; hence
 $\$6400 \times .03\frac{1}{3} = \$213.33\frac{1}{3}$, discount;
 $\$6400 - \$213.33\frac{1}{3} = \$6186.66\frac{2}{3}$, to be hired;
 $\$6186.66\frac{2}{3} \times .03\frac{1}{3} = \$206.22\frac{2}{3}$, int. on hired money;
 $\$213.33\frac{1}{3} - \$206.22\frac{2}{3} = \$7.11\frac{1}{3}$, *Ans.*

BANKING.

(576, page 333.)

- Ex. 1.** Int. of \$1487 at 6 % for 33 da. = \$8.18, discount;
\$1487 — \$8.18 = \$1478.82, proceeds, *Ans.*
- Ex. 2.** Int. of \$384.50 at 7 % for 93 da. = \$6.95, discount;
\$384.50 — \$6.95 = \$377.55, proceeds, *Ans.*
- Ex. 3.** Int. of \$975 at 8 % for 63 da. = \$13.65, discount;
\$975 — \$13.65 = \$961.35, proceeds of note;
\$1000 — \$961.35 = \$38.65, *Ans.*
- Ex. 4.** 195 A. 2 R. 25 P. = 195.65625 A.;
\$27.50 × 195.65625 = \$5380.547 +, selling price;
amt. of \$5380.547 at 7 % for 4 mo. 18 da.
= \$5524.925,
int. of \$5524.925 at 7 % for 4 mo. 18 da.
= \$148.25, discount;
\$5524.925 — \$148.25 = \$5376.68, *Ans.*
- Ex. 5.** From Aug. 26 to Nov. 29 is 95 da., the term of discount. Int. of \$1962.45 at 7 % for 95 da. = \$36.25; \$1962.45 — \$36.25 = \$1926.20, proceeds.
- Ex. 6.** Int. of \$1066.75 at 6 % for 74 da. = \$13.16, disc't;
\$1066.75 — \$13.16 = \$1053.59, proceeds.
- Ex. 7.** Note due Aug. $20\frac{1}{2}$; term of discount, 49 da.;
int. of \$784.72 at 8 % for 49 da. = \$8.54, discount,
\$784.72 — \$8.54 = \$776.18, proceeds.
- Ex. 8.** Int. of \$1845.50 at 24 % for 31 da. = \$38.14, disc't;
\$1845.50 — \$38.14 = \$1807.36, proceeds.
- Ex. 9.** \$950 ÷ 1.0175 = \$933.66, true present worth;
\$950 — \$933.66 = \$16.34, true discount;
\$950 × .01804 = 17.18, bank discount;
\$17.18 — \$16.34 = \$.84, *Ans.*

Ex. 10. $\$1375.50 \div 1.01 = \$1361.88$, true present worth;
 $\$1375.50 - \$1361.88 = \$13.62$, true discount;
 $\$1375.50 \times .01 = 13.76$, bank " "

 $\$.14$, *Ans.*

(577, page 334.)

- Ex. 1. $\$1275 \div .9895 = \$1288.53$ —, *Ans.*
 Ex. 2. $\$5000 \div .9845 = \$5078.72$ +, *Ans.*
 Ex. 3. The proceeds of \$1 for 3 mo. at 7 % are \$.9825;
 $\$276.84 \div .9825 = \$281.77$ +, *Ans.*
 Ex. 4. The proceeds of \$1 for 4 mo. 3 da. at $7\frac{1}{2}$ % are \$.974375
 $\$1486.90 \div .974375 = \$1526$ +, *Ans.*
 Ex. 5. Proceeds of \$1 for 6 mo. 3 da. at 24 % = \$.878;
 $\$496 \div .878 = \$564.92$, *Ans.*
 Ex. 6. Proceeds of \$1 for 33 da. at 5 % = \$.9954166+;
 $\$1200 \div .9954166 = \$1205.52$ +, *Ans.*
 Ex. 7. Proceeds of \$1 for 63 da. at 18 % = \$.9685;
 $\$575 \div .9685 = \$593.70$, *Ans.*
 Ex. 8. Proceeds of \$1 for 110 da. at 12 % = \$.963 $\frac{1}{3}$;
 $\$187.50 \div .963\frac{1}{3} = \$194.63$ +, *Ans.*

(578, page 331.)

- Ex. 1. Discount of \$100 for 33 da. = \$.55;
 $\$100 - \$.55 = \$99.45$, proceeds;
 interest on proceeds at 1 % = \$.0911625;
 $\$.55 \div .0911625 = 6\frac{2}{3}\frac{2}{3}$ %, *Ans.*
 Ex. 2. Discount of \$100 for 2 mo. 3 da. = \$4.20;
 $\$100 - \$4.20 = \$95.80$, proceeds;
 interest on proceeds at 1 % = \$.16765;
 $\$4.20 \div \$.16765 = 25\frac{2}{3}\frac{5}{7}$ %, *Ans.*

(334—336)

Ex. 3. Discount of \$100 for 93 da. = \$4.65;
 \$100 — \$4.65 = \$95.35, proceeds;
 interest on proceeds at 1 % = \$.24632 $\frac{1}{2}$;
 \$4.65 + \$.24632 $\frac{1}{2}$ = 18 $\frac{1}{2}$ $\frac{67}{100}$ %, *Ans.*

Ex. 4. *Ans.*, 5 $\frac{5}{8}$ %, 6 $\frac{5}{8}$ %, 7 $\frac{4}{11}$ %, 10 $\frac{1}{11}$ %, 13 $\frac{1}{4}$ %.

Ex. 5. *Ans.*, 9 $\frac{5}{8}$ $\frac{6}{7}$ %, 12 $\frac{5}{8}$ $\frac{2}{3}$ %, 25 $\frac{2}{3}$ %, 81 $\frac{3}{4}$ %, 38 $\frac{1}{2}$ %

(579, page 336.)

Ex. 1.

\$\$.45 $\frac{5}{8}$ = int. of \$100 at 5 % for 33 da.;

\$.55 = " " " 6 % " "

\$.64 $\frac{1}{8}$ = " " " 7 % " "

\$.91 $\frac{3}{8}$ = " " " 10 % " "

$100.45\frac{5}{8} \times .0045\frac{5}{8}$
 $\$ \frac{\quad}{5} = \text{int. at 1 \% of amt. of \$100 at 5 \% ;}$

$100.55 \times .0055$
 $\$ \frac{\quad}{6} = \text{" " " " " 6 \% ;}$

$100.64\frac{1}{8} \times .0064\frac{1}{8}$
 $\$ \frac{\quad}{7} = \text{" " " " " ; \% ;}$

$100.91\frac{3}{8} \times .0091\frac{3}{8}$
 $\$ \frac{\quad}{10} = \text{" " " " " 10 \% ;}$

Hence

$.45\frac{5}{8} \times \frac{5}{100.45\frac{5}{8} \times .0045\frac{5}{8}} = \frac{5}{1.0045\frac{5}{8}} = 4\frac{2}{3}\frac{5}{11} \% \text{ cor. } - .5 \% ;$

$.55 \times \frac{6}{100.55 \times .0055} = \frac{6}{1.0055} = 5\frac{1}{2}\frac{4}{11} \% \text{ " " 6 \% ;}$

$.64\frac{1}{8} \times \frac{7}{100.64\frac{1}{8} \times .0064\frac{1}{8}} = \frac{7}{1.0064\frac{1}{8}} = 6\frac{1}{2}\frac{5}{7} \% \text{ " " 7 \% ;}$

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$$.91\frac{2}{3} \times \frac{10}{100.91\frac{2}{3} \times .0091\frac{2}{3}} = \frac{10}{1.0091\frac{2}{3}} = 9\frac{201}{1211} \% \text{ cor. to } 10 \%$$

NOTE.—From the solution given above, we see that the result after cancellation, is obtained, by dividing the given rate by the amount of \$1 for the given time.

Ex. 2. $\$1.0206\frac{2}{3}$ = amt. of \$1 at 8 % for 3 mo. 3 da. ;
 $.08 \div 1.0206\frac{2}{3} = 7\frac{1}{3}\frac{2}{3} \% , \text{ Ans.}$

Ex. 3. 1 % per mo. = 12 % per annum ;

$1\frac{1}{2}$ " " = 18 " "

2 " " = 24 " "

$2\frac{1}{2}$ " " = 30 " "

$\$1.0210$ = amt. of \$1 for 63 da. at 12 % ,

$\$1.0315$ = " " " " 18 % ;

$\$1.0420$ = " " " " 24 % ;

$\$1.0525$ = " " " " 30 % ;

$.12 \div 1.021 = 11\frac{662}{1021} \% , \text{ to pay } 1 \% \text{ per mo. ,}$

$.18 \div 1.0315 = 17\frac{929}{2063} \% , \text{ " " } 1\frac{1}{2} \% \text{ " "}$

$.24 \div 1.042 = 23\frac{17}{321} \% , \text{ " " } 2 \% \text{ " "}$

$.30 \div 1.0525 = 28\frac{1}{4}\frac{1}{2} \% , \text{ " " } 2\frac{1}{2} \% \text{ " "}$

Ex. 4. $\$1.105$ = amt. of \$1 for 18 mo. at 7 % ;

$.07 \div 1.105 = 6\frac{74}{221} \% , \text{ Ans.}$

(336)

EXCHANGE.

(599, page 340.)

Ex. 1. $\$1.005 - \$.0055 = \$.9995$, cost of exchange for \$1;
 $\$5400 \times .9995 = \$5397.30$, *Ans.*

Ex. 2. $\$1 - \$.0325 = \$.9675$, cost of exchange for \$1;
 $\$3000 \times .9675 = \$2902.50$, *Ans.*

Ex. 3. $\$1.01375 - \$.0155 = \$.99825$, cost exchange for \$1;
 $\$4800 \times .99825 = \$4791.60$, *Ans.*

Ex. 4. $\$550.62 + 1.035 = \$532$, *Ans.*

Ex. 5. $\$1.0175 - \$.0155 = \$1.012$, cost exchange for \$1;
 $\$1324.74 \div \$1.112 = \$1309.03$ —, *Ans.*

Ex. 6. $\$7500 \times .015 = \$112.50$, commission;
 $\$7500 - \$112.50 = \$7387.50$, net proceeds of sale;
 $\$7387.50 \div 1.005 = \$7350.75$ —, *Ans.*

Ex. 7. $\$4800 \times .005 = \$24$, discount;
 $\$4800 - \$24 = \$4776$ rec'd per dft. on Baltimore
 $\$4800 \div 1.0075 = 4764.27$ “ “ “ “ Hartford;

 $\$11.73$, *Ans.*

Ex. 8. $\$508.75 \div 1.0175 = \$500$, dividend;
 $\$500 \div .0625 = \$8000 = 80$ shares, *Ans.*

Ex. 9. $\$5075 - \$5000 = \$75$, premium;
 $\$75 \div \$5000 = .015 = 1\frac{1}{2}\%$, rate of premium, *Ans*
 (340)

Revised and adapted to the Act of March 3, 1878.

(606, page 346.)

- Ex. 1. £325 3 s. 9 d. = £325.1875;
 $\$4.895 \times 325.1875 = \$1591.79$, *Ans.*
- Ex. 2. $\$1 \div 5.31 \times 6000 = \$1129.94$, *Ans.*
- Ex. 3. $\$.771 \times 1.0025 = \$.7729275$, cost of exchange.
 $\$.7729275 \times 3000 = \$2318.78$, cost of bill.
 $\$.771 - \$.734 \div \$.734 = .05$; 5%, *Ans.*
- Ex. 4. $\$831.12 \div \$.205 = 4054.243$, No. of lire, *Ans.*
- Ex. 5. $\$4.855 \times 125 = \$606.875$, *Ans.*
- Ex. 6. $\$7536.30 \div \$4.9125 = 1534.106$, No. of £.
 $\pounds 1534.106 = \pounds 1534$ 2 s. 1 d. +, *Ans.*
- Ex. 7. $9087.5 \div 2.41 = \$3770.746$, *Ans.*
- Ex. 8. 4.51 milreis $\times 2500 = 11275$ milreis, *Ans.*
- Ex. 9. $\$1736.10 \div 360 = \$4.82\frac{1}{4}$, *Ans.*
- Ex. 10. $1500 \div .9315 = 1610.30$, cost of ex. in dollars.
 $\$1.065 \times 1500 = \$1597.50$; $\$1610.30 - \$1597.50$
 $= \$12.80$, *Ans.*
- Ex. 11. $25256.8 \div 131 = 192.8$, No. oz. fine gold required;
 $480 \times 192.8 = 92544$, No. grains " " "
 $92544 \div 23.22 = 3985.53$, value of gold in U. S. coin;
 $\$3985.53 \times 1.03 = \$4105.10$, cost of goods in store.
 $\$.198 \times 25256.8 = \$5000.85$, cost by draft.
 $\$5000.85 - \$4105.10 = \$895.75$, *Ans.*

Ex. 12. $240 \text{ d.} \div 61 \text{ d.} = 3.93442$, No. of oz. fine silver in a £.

$480 \times 3.93442 = 1888.5216$, No. of gr. fine silver in a £.

$420 \times .9 = 378$, No. gr. fine silver in 1 Trade dollar.

$1888.5216 \div 378 = 4.996$, No. Trade dollars, *Ans.*

Ex. 13. $\$858.85 \div 890 = \$.9537$, *Ans.*

(608, page 350.)

Ex. 1. (?) crowns = \$5000.

\$4.91 = £1.

£1 = 18.5 crowns; (?) = 18792.1 crowns.

Ex. 2. \$(?) = 7680 marks.

5.16 fr. = \$1.

1 mark = 1.23 fr.; (?) = \$1830.69, *Ans.*

Ex. 3. \$(?) C. = \$750 N. O.

\$1 N. O. = \$.9875 C.;

(?) = \$740.63, proceeds by direct ex.

\$(?) C. = \$750 N. O.

\$1 N. Y. = \$1.015 C.

\$1 N. O. = \$.99 N. Y.

1 = .995.

(?) = \$749.87, proceeds by arbitration.

$\$749.87 - \$740.63 = \$9.24$ gain, *Ans.*

Ex. 4. $\$.415 \times 6000 = \$2490$, proceeds by draft.

\$(?) = 6000 guilders.

11.19 guil. = £1.

£1 = \$4.88.

$1.0125 = 1$; (?) = \$2584.31, proceeds by arbitration.

$\$2584.31 - \$2490 = \$94.31$, *Ans.*

(346-350)

- Ex. 5. \$4.895 = £1.
 £1 = 24.965 fr.
 (?) fr. = \$1; ? = 5.10, course of exchange.
- Ex. 6. (?) guilders = \$6400.
 \$4.85 = £1 = 240 d.
 18 d. = 1 guilder.
 1 = .995.
 1.005 = 1; ? = 17419.43 guilders.
 \$6400 ÷ \$.41 = 15609.75, direct draft.
 17419.43 guil. — 15609.75 guil. = 1809.68 guil., *Ans*
- Ex. 7. \$5800 × .95 = \$5510, cost in New Orleans.
 \$(?) P. = \$5510 N. O.
 \$1 N. Y. = \$1.02 P.
 \$1 N. O. = \$.995 N. Y.
 1 = 1.0025; ? = \$5606.08, *Ans*.
- Ex. 8. 19570 ÷ 5.12 = 3822.26 +, cost in dollars, direct.
 \$(?) = 19570 fr.
 £1 = \$4.89.
 25.19 fr. = £1.
 1 = 1.0025; ? = \$3808.516 +, by arbitration.
 \$3822.26 — \$3808.516 = \$13.74, gain by arbitration, *Ans*.
- Ex. 9. \$(?) = £1.
 £1 = 25.71 fr.
 5.155 fr. = \$1; ? = \$4.987, *Ans*.
- Ex. 10. £(?) = \$3000.
 \$1 = 5.16 fr.
 125 fr. = 100 m.
 1.715 m. = 1 guilder.
 11.82 g. = £1.
 ? = £610.9128 = £610 18 s. 3 d., am't in bank.
 \$3000 ÷ \$4.915 = 610.3763, No. £ by direct ex.
 £610.3763 = £610 7 s. 6 d., difference 10 s. 9 d.,
 gain, *Ans*.

(617, page 353.)

Ex. 1.

$$\$500 \times 30 = \$15000$$

$$400 \times 60 = 24000 \quad 93000 \div 1500 = 62 \text{ da., term of credit;}$$

$$600 \times 90 = 54000 \quad \text{Jan. 1} + 62 \text{ da.} =$$

$$\begin{array}{r} \hline \$1500 \end{array} \quad \begin{array}{r} \hline \$93000 \end{array} \quad \text{Mar. 3, 1860, equated time}$$

$$\text{Ex. 2. } \frac{1}{3} + \frac{1}{4} = \frac{7}{12}; \quad 1 - \frac{7}{12} = \frac{5}{12};$$

$$\frac{1}{3} \times 3 = 1$$

$$\frac{1}{4} \times 8 = 2$$

$$\frac{5}{12} \times 12 = 5 \quad 8 \div 1 = 8 \text{ mo., Ans.}$$

$$\begin{array}{r} \hline 1 \end{array} \quad \begin{array}{r} \hline 8 \end{array}$$

$$\text{Ex. 3. } \$480 \times 90 = \$43200$$

$$320 \times 60 = 19200$$

$$\begin{array}{r} \hline \$800 \end{array} \quad \begin{array}{r} \hline \$62400 \end{array}$$

$$62400 \div 800 = 78 \text{ da., average term of credit;}$$

hence the note for the whole amount will run

9 mo. 12 da.

(353)

PERCENTAGE.

$\$480 \div 1.015 = \$472.906$, present worth of $\$480$;

$\$320 \div 1.01 = 316.831$, " " " 320;

$\$789.737$, present worth both debts

Amount of $\$800$ for 9 mo. 12 da. = $\$837.60$

" $\$789.737$ for 1 yr. = 837.12

$\$.48$, Ans.

Ex. 4.

$\$280 \times 3 = \$ 840$

$300 \times 4 = 1200$ $6400 \div 1340 = 4$ mo. 23 da., average Cr

$200 \times 5 = 1000$ Apr. 1 + 4 mo. 23 da. = Aug. 24, Ans

$560 \times 6 = 3360$

$\$1340$ $\$6400$

(618, page 356.)

Ex. 1.

Due.	Da.	Items.	Prod.
Mar. 4	0	250	
" 25	21	300	7500
Apr. 16	43	96	4128
" 30	57	200	11400
May 17	74	550	28900
		1256	48988

$48988 \div 1256 = 39$ da.

Mar. 4 + 39 da. =

Apr. 12, 1860, Ans.

Ex. 2.

Due.	Da.	Items.	Prod.
Oct. 12, 1859	0	180	
Nov. 6, "	25	300	7500
Jan. 15, 1860	95	150	14250
Mar. 19, "	159	350	55650
Feb. 24, "	135	130	17750
Mar. 25, "	165	140	23100
		1250	118050

$118050 \div 1250 = 94$

da.; Oct. 12, 1859

+ 94 da. =

Jan. 14, 1860, Ans

Ex. 3.

Due.	Da.	Items.	Prod.
Nov. 30, 1860		240	
Jan. 11, 1861	42	500	21000
Feb. 23, "	85	436	37060
Mar. 17, "	107	325	34775
Apr. 25, "	146	436	63856
May 16, "	167	537	89679
		2474	246170

$246170 \div 2474$

= 100 da.;

Nov. 29, 1860 +

100 da. =

Mar. 10, '61, Ans

(354—356)

Ex. 4.

Due.	Da.	Items.	Prod.
Aug. 16, 1859		350	
Oct. 15, "	60	250	15000
Dec. 14, "	120	300	36000
Feb. 12 1860	180	248	44640
		1148	95640

$95640 \div 1148 = 83$
 da.; Aug. 16, 1859
 $+ 83 \text{ da.} = \text{Nov. 7, 1859, Ans.}$

(620, page 360.)

Ex. 2.

Due.	Da.	Items.	Prod.	Due.	Da.	Items.	Prod.
Mar. 1	0	436		May 27	87	400	34800
Apr. 12	42	548	23016	" 9	69	650	44850
July 16	137	312	42744	June 20	111	200	22200
Sept. 14	197	536	105592	Aug. 3	155	84	13020
		1832	171352			1334	114870
		1334	114870				
		498	56482				

Balances,

 $56482 \div 498 = 113 \text{ da. ;}$
 $\text{Mar. 1, 1860} + 113 \text{ da.} = \text{June 22, 1860, due.}$

Ex. 3.

Due.	Da.	Items.	Int.	Due.	Da.	Items.	Int.
Apr. 1	85	54.36	.77	Apr. 1	85	50.00	.71
" 12	74	28.45	.35	June 18	7	30.00	.03
Mar. 16	101	95.75	1.61	" 12	13	125.00	.27
June 25	0	26.32		" 20	5	150.00	.13
		204.88	2.73			355.00	1.14
			1.14			204.88	
		Balances,	1.59			150.12	

Total da's.

$\text{Int. on } \$150.12 \text{ for 1 da.} = \$0.02502 ; \$1.59 \div \$0.02502$
 $= 64 \text{ da. ; June 25, 1858} + 64 \text{ da.} = \text{Aug. 28, 1859.}$

Ex. 4.

Due.	Da.	Items.	Int.	Due.	Da.	Items.	Int.
Jan. 1	95	36.72	.58	Jan. 10	88	98.72	1.42
Feb. 1	64	48.25	.61	" 21	75	25.84	.32
Mar. 17	20	72.36	.24	Mar. 23	14	15.17	.04
Apr. 1	5	98.48	.08	Apr. 6	0	8.96	
		255.81	1.41			148.69	1.78
		148.69					1.41
		Balance of Items,	107.12			Balance of Int.,	.87

Balance of Items,

Balance of Int.,

$\text{Int. of } \$107.12 \text{ for 1 da.} = .018 ;$
 $\$.37 \div \$.018 = 20 \text{ da., Ans.}$

(356-360)

Ex. 5.

Due.	Da.	Items.	Prod.	Due.	Da.	Items.	Prod.
Apr. 25	24	1000	24000	Apr. 1	0	560	
				" 21	20	324	6480
		1000	24000			884	
		884	24000				
Balances,		116	17520				

$$17520 \div 116 = 151 \text{ da.}; \text{ Apr } 1. + 151 \text{ da.} = \text{Aug. } 30.$$

Ex. 6.

Due.	Da.	Items.	Prod.	Due.	Da.	Items.	Prod.
Aug. 12	11	684	7524	Aug. 1	0	839	
Oct. 15	75	468	35100				
		1152	42624			839	
		839					
Balances,		313	42624				

$$42624 \div 313 = 136 \text{ da.};$$

$$\text{Aug. } 1. + 136 \text{ da.} = \text{Dec. } 15, \text{ Ans.}$$

Ex. 7.

Due.	Da.	Items.	Prod.	Due.	Da.	Items.	Prod.
Mar. 1	0	500		Apr. 1	31	1000	31000
June 1	92	800	73600				
Aug. 1	153	500	91800			1000	31000
		1900	175400				
		1000	31000				
Balances,		900	134400				

$$134400 \div 900 = 149;$$

$$\text{Mar. } 1. + 149 \text{ da.} = \text{July } 28, \text{ Ans.}$$

Ex 8.

Due.	Da.	Items.	Prod.
Apr. 12	0	500	
Sept. 20	161	1000	161000
		1500	161000

$$161000 \div 1500 =$$

$$107 \text{ da.}; \text{ Apr. } 12 +$$

$$107 \text{ da.} = \text{July } 28,$$

the average maturity of the two debts Hence to discharge the whole obligation by two equal payments at an interval of 60 da., these payments must be made, one 30 da. *before* July 28, and the other 30 da. *after* July 28; and we have

$$\text{July } 28 - 30 \text{ da.} = \text{June } 28, \text{ date of } 1^{\text{st}} \text{ payment}$$

$$\text{July } 28 + 30 \text{ da.} = \text{Aug. } 27, \quad " \quad 2^{\text{d}} \quad "$$

(360, 361)

EQUATION OF PAYMENTS.

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Ex. 9.

Due.	Da.	Items.	Prod.	Due.	Da.	Items.	Prod.
Sept. 12	0	530.84		Sept. 14	2	436	872
" 20	8	236.48	1892	" 25	13	320	410
" 30	18	739.66	13512	Oct. 3	21	560	11760
Oct. 5	23	273.44	6289	" 17	35	370	12950
" 6	34	194.78	66.8	Nov. 16	65	840	54000
" 29	47	536.42	25212	" 24	73	560	40880
		2511.52	53328			3086	125222
						2511.52	53328
						574.48	71894

balances,

$$71894 + 574.48 = 125 \text{ da.};$$

$$\text{Sept 12, 1859} + 125 \text{ da.} = \text{Jan. 15, 1860, Ans.}$$

Ex. 10.

Due.	Da.	Items.	Prod.	Due.	Da.	Items.	Prod.
June 1	0	536.78		June 3	2	500	1000
July 16	45	2156.94	97003	July 1	30	1000	30000
Aug 12	72	843.75	60760	Nov. 1	153	1500	225000
Sept 12	103	504.37	61220				
Nov. 18	170	856.48	145602				
		4988.32	364635			3000	200000
		3000.00	200500				
		1988.32	104135				

Balances,

$$104135 \div 1988.32 = 52 \text{ da.};$$

$$\text{June 1} + 52 \text{ da.} = \text{July 23, Ans.}$$

ACCOUNT SALES.

(625, page 362.)

Ex. 1 We first average the sales, using Apr. 1, the earliest

- maturity of the entire account, for a focal date, thus:

Due.	Da. from Apr. 1.	Items.	Prod.
May 15	44	4368.00	192192
" 5	34	5344.80	181723
June 28	88	3650.00	321200
		13362.80	695115

$$695115 \div 13362.80 = 52 \text{ da.};$$

Apr. 1. + 52 da. = May 23, date for commission and guaranty. We now average the entire account, using the same focal date as before, and putting

(361, 362)

Freight, Primage, Wharfage and Cartage, as one item; and also, commission and guaranty.

Due.	Da.	Items.	Prod.	Due.	Da.	Items.	Prod.
Apr. 1	0	185.30		May 15	44	43680.00	192192
June 3	63	3207.07	202045	" 5	34	5344.80	181723
June 28	88	37.68	3315	June 28	88	3650.00	321200
May 23	52	443.27	23050				
		3873.32	228410			13362.80	696111
						3873.32	228410
						9489.48	466705

$466705 \div 9489.48 = 49$ da.; Balances,
 $\text{Apr. 1} + 49 \text{ da.} = \text{May 20, proceeds due.}$

Ex. 2. Equation for the average of sales.

Due.	Da. from May 1.	Items.	Prod.
June 3	33	1250	41250
" 30	60	2275	136500
July 29	89	2450	218050
Aug. 6	97	300	29100
		6275	424900

$424900 \div 6275 = 68$ da. May 1
 $+ 68 \text{ da.} = \text{July 8, date for commission;}$
 $\$175.48 + \$56.25 + \$8.37 = \$240.10,$ charges made
 May 1, for freight, etc.

Storage on 200 bbl. 5 wk. = storage on 1 bbl. 1000 wk.;
 " " 350 " 9 " = " " 3150 "
 " " 400 " 13 " = " " 5200 "
 " " 50 " 14 " = " " 700 "
10050 wk.

$10050 \times .02 = \$201$ storage, due Aug. 6;

$\$6275 \times .035 = \$219.63$ commission, due July 8.

Due.	Da.	Items.	Prod.	Due.	Da.	Items.	Prod.
May 1	0	240.10		June 3	33	1250.00	41250
Aug. 6	97	201.00	19497	" 30	60	2275.00	136500
July 8	68	219.62	14935	July 29	89	2450.00	218050
				Aug. 6	97	300.00	29100
		660.72	34422			6275.00	424900
						660.72	34432
						5614.28	390468

$390468 \div 5614.28 =$

Balances,

$70 \text{ da.}; \text{May 1} + 70 \text{ da.} = \text{July 10, proceeds due.}$

PARTNERSHIP.

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SETTLEMENT OF ACCOUNTS CURRENT.

(626, page 364.)

Ex 1.

Due.	Da.	Items.	Int.	Cash val.	Due.	Da.	Items.	Int.	Cash val.
Jan. 12	140	500.36+	11.67	512.03	Jan. 1	151	536.72+	13.51	550.23
" 26	126	250.48+	5.26	255.74	Feb. 3	118	486.57+	9.57	496.14
Feb 13	106	400.00+	7.20	407.20	Mar. 26	67	1260.78+	14.08	1274.86
Mar 16	77	750.00+	9.63	759.63	Apr. 20	42	756.36+	5.29	761.65
Apr 25	37	200.00+	1.23	201.23	May 12	20	248 79+	.83	249.62
				2135.83					3332.50

$$\$3332.50 - \$2135.83 = \$1196.67, \text{ Ans.}$$

Ex. 2.

Due.	Da.	Items.	Int.	Cash val.	Due.	Da.	Items.	Int.	Cash value.
Sept. 3	119	478.36+	11.07	489.43	Sept. 17	105	96.54+	1.97	96.51
Jan. 2	2	256.37--	.10	256.27	" 20	102	200.00+	3.97	203.97
" 21	21	375.26--	1.53	373.73	Oct. 3	89	325.00+	5.62	330.62
Feb 12	43	80 00--	.67	79.33	Nov. 17	44	50.00+	.43	50.43
Dec. 15	16	148.76+	.46	149.22	Dec. 27	4	84.00+	.07	84.07
				1347.98					767.60

$$\$1347.98 - \$767.60 = \$580.38, \text{ Ans.}$$

PARTNERSHIP.

(629, page 365.)

Ex. 1 $\$6470 + \$3780 + \$9860 = \$20110$

$$\$20110 : \$6470 = \$7890 : (?) = \$2538.453, \text{ A's share.}$$

$$\$20110 : \$3780 = \$7890 : (?) = \$1483.053, \text{ B's "}$$

$$\$20110 : \$9860 = \$7890 : (?) = \$3868.493, \text{ C's "}$$

Ex. 2. $\$1847.50 - \$739 = \$1108.50, \text{ C pays;}$

$$\frac{739}{1847.50} = \frac{2}{5}, \text{ B's fraction; } \frac{1108.50}{1847.50} = \frac{3}{5}, \text{ C's fraction;}$$

$$\$375 \times \frac{2}{5} = \$150, \text{ B's gain;}$$

$$\$375 \times \frac{3}{5} = \$225, \text{ C's "}$$

(364, 365)

Ex. 3. $\$10000$ $\frac{10000}{28000} = \frac{25}{70}$, A's fraction;
 12800 $\frac{12800}{28000} = \frac{32}{70}$, B's "
 3200 $\frac{3200}{28000} = \frac{8}{70}$, C's "

 $\$26000$
 $\$9400 - (\$1500 + \$3400) = \$4500$, net profits;
 $\$4500 \times \frac{25}{70} = \$1730.77$, A's share of net profits;
 $\$4500 \times \frac{32}{70} = 2215.38$, B's " " "
 $\$4500 \times \frac{8}{70} = 553.85$, C's " " "
 $\$553.85 + \$1500 = \$2053.85$, C's whole income.

Ex. 4. $115 \text{ A. } 32 \text{ P.} = 115.2 \text{ A.}; \$3.75 \times 115.2 = \$432$, rent;
 $144 + 160 + 192 + 324 = 820$ sheep;
 $820 : 144 = \$432 : (?) = \$75.86$, A pays;
 $820 : 160 = \$432 : (?) = \$84.29$, B "
 $820 : 192 = \$432 : (?) = \$101.15$, C "
 $820 : 324 = \$432 : (?) = \$170.69$, D "

Ex. 5. $\$6 + \$4 + \$2 = \$12$
 $\$2640 \times \frac{6}{12} = \$1320$, B's share;
 $\$2640 \times \frac{4}{12} = 880$, C's "
 $\$2640 \times \frac{2}{12} = 440$, D's "

Ex. 6. $\$6300 \times \frac{1}{3} = \$900$, A's; $\$6300 \times \frac{1}{3} = 1260$, B's;
 $\$6300 \times \frac{2}{3} = \$1400$, C's; $\$900 + \$1400 = \$2300$, D's
 $\$6300 - (\$900 + \$1260 + \$1400 + \$2300) = \$440$
 for E and F;
 $\$440 \times \frac{2}{3} = \$165$, E's; $\$440 \times \frac{1}{3} = \$275$, F's.

Ex. 7. $\frac{2}{3} : \frac{5}{6} = \frac{4}{6} : \frac{5}{6} = 4 : 5$; $4 + 5 = 9$;
 $\$90 \times \frac{4}{9} = \$40$, share of first;
 $\$90 \times \frac{5}{9} = 50$, " second.

Ex. 8. If the younger has 8 shares,
 the elder will have 9 "

17, sum of shares
 (366)

$$\begin{aligned}\$5463.80 \times \frac{8}{17} &= \$2571.20, \text{ the younger receives;} \\ \$5463.80 \times \frac{9}{17} &= 2892.60, \text{ the elder} \quad "\end{aligned}$$

Ex. 9. $\$1680 - \$840 = \$840$, A and B's gain; and since C's gain is equal to A and B's gains together, his stock must be $\$12000 + \$8000 = \$20000$;
 $\$840 \times \frac{8}{20} = \$336$, A's gain;
 $\$840 \times \frac{12}{20} = \$504$, B's "

Ex. 10. Since the portions of the stock which they severally put in, are proportioned to their gains respectively, we have $\$2000 + \$2800.75 + \$1685.25 + \$1014 = \$7500$, whole gain;
 $\$7500 : \$2000 = \$22500 : (?) = \$6000$, A's stock
 $\$7500 : \$2800.75 = \$22500 : (?) \times \$8402.25$, B's "
 $\$7500 : \$1685.25 = \$22500 : (?) = \$5055.75$, C's "
 $\$7500 : \$1014 = \$22500 : (?) = \$3042$, D's "

Ex. 11. $\frac{1}{8} : \frac{2}{5} : \frac{4}{3} : \frac{1}{2} = \frac{15}{80} : \frac{36}{80} : \frac{40}{80} : \frac{30}{80} = 15 : 36 : 40 : 30$
 $15 + 36 + 40 + 30 = 121$, sum of proportional terms.
 $\$30000 \times \frac{15}{121} = \$3719\frac{1}{11}$, share of 1st;
 $\$30000 \times \frac{36}{121} = 8925\frac{75}{121}$, " " 2d;
 $\$30000 \times \frac{40}{121} = 9917\frac{40}{121}$, " " 3d;
 $\$30000 \times \frac{30}{121} = 7438\frac{2}{121}$, " " 4th.

Ex. 12. $\$71.27 + \$142.54 = \$213.81$, gain of A and B;
 $\$1200 - \$500 = \$700$, stock of A and B;
 $\$700 : \$500 = \$213.81 : (?) = \$152.72\frac{1}{2}$, C's gain;
 $\$213.81 : \$71.27 = \$700 : (?) = \$233.33\frac{1}{3}$, A's stock
 $\$213.81 : \$142.54 = \$700 : (?) = \$466.66\frac{2}{3}$, B's "

Ex. 13. $3 + 5 + 7 = 15$; $\$18840 \times \frac{7}{15} = \$8792$, C's stock;
 $\$8792 \times \frac{3}{15} = \$1758.40$, A's gain;
 $\$8792 \times \frac{5}{15} = 2930.66\frac{2}{3}$, B's "
 $\$8792 \times \frac{7}{15} = 4102.93\frac{1}{3}$, C's "

Ex. 14. $\frac{3}{4}$, $\frac{9}{10}$, $\frac{11}{20} = \frac{16}{20}$, $\frac{18}{20}$, $\frac{13}{20}$; and these fractions are proportioned to 15, 18 and 13.

Hence, A and B receive 15 shares,

$$\begin{array}{rcccc} \text{A} & \text{"} & \text{C} & \text{"} & 18 & \text{"} \\ \text{B} & \text{"} & \text{C} & \text{"} & 13 & \text{"} \\ \hline \end{array}$$

A, B and C receive $\frac{1}{2}$ of 46=23 shares; and

A will receive 23—13=10 shares,

B " " 23—18= 5 "

C " " 23—15= 8 " . Hence

A has $\frac{10}{23}$ of \$26.45=\$11.50;

B " $\frac{5}{23}$ of \$26.45= 5.75;

C " $\frac{8}{23}$ of \$26.45= 9.20.

(630, page 368.)

Ex. \$357 $\times$ 5=\$1785, A's product;

371 $\times$ 7= 2597, B's "

154 $\times$ 11= 1694, C's "

\$6076

\$6076 : \$1785=\$347.20 : (?)=\$102, A's gain;

\$6076 : \$2597=\$347.20 : (?)=\$148.40, B's "

\$6076 : \$1694=\$347.20 : (?)=\$ 96.80, C's "

Ex 2 5 $\times$ 12=60 cows for 1 week=A's use of pasture,

4 $\times$ 10=40 " " " =B's " "

6 $\times$ 8=48 " " " =C's " "

148 " " "

\$55.50 $\times$ $\frac{60}{148}$ =\$22.50, A pays

\$55.50 $\times$ $\frac{40}{148}$ = 15 , B "

\$55.50 $\times$ $\frac{48}{148}$ = 18 , C "

(367, 368)

Ex. 3. $\$4500 - \$1800 = \$2700$, B's gain;
 $\$15000 \times 12 = \$180000$, B's capital for 1 mo.;
 $\$2700 \div 180000 = \$0.015$ gain per month on \$1;
 $\$.015 \times 9 = \$.135$, gain on \$1 for 9 mo., or C's time;
 $\$1800 \div .135 = \$13333.33\frac{1}{3}$, value of C's land;
 $\$13333\frac{1}{3} \div 125 = \$106\frac{2}{3}$, value of land per acre, *Ans*

Ex. 4 $\$4200 \times 9 = \$37800$ $\$1500 \times 6 = \$9000$
 $\$4400 \times 7 = 30800$ $\$1000 \times 10 = 10000$

A's product, \$68600; B's product, \$19000
 $\$68600 + \$19000 = \$87600$, sum of products;
 $\$876 : \$686 = \$772.20 : (?) = \$604.71$, A's gain;
 $\$876 : \$190 = \$772.20 : (?) = \$167.49$, B's "

Ex. 5 $30 \times 12 \times 9 = 3240$ hours' work by 1st company;
 $32 \times 15 \times 10 = 4800$ " " " 2d "
 $28 \times 18 \times 11 = 5544$ " " " 3d "
 $20 \times 15 \times 12 = 3600$ " " " 4th "

17184 " " " all.
 $\$1500 \times \frac{3240}{17184} = \$282.82$, wages of 1st company;
 $\$1500 \times \frac{4800}{17184} = 418.99$, " " 2d "
 $\$1500 \times \frac{5544}{17184} = 483.94$, " " 3d "
 $\$1500 \times \frac{3600}{17184} = 314.25$, " " 4th "

Ex. 6. To avoid fractions, suppose A had $\$5 \times 6 = \$30$, and
B had $\$8 \times 6 = \$48$. Then
 $\$30 \times 4 = \$120$ $\$48 \times 4 = \$192$
 $\$15 \times 8 = 120$ $\$16 \times 8 = 128$

$\$240$, A's prod.; $\$320$, B's prod.;
 $\$240 + \$320 = \$560$, sum of products;
 $\$4000 \times \frac{240}{560} = \$1714\frac{2}{7}$, A's,
 $\$4000 \times \frac{320}{560} = 2285\frac{5}{7}$, B's.

(368, 369)

Ex. 7 $\$15800 \times 4 = \$63200$
 $14600 \times 2 = 29200$
 $13100 \times 4 = 52400$
 $14100 \times 8 = 112800$ $\$257600$, B's prod.;

 $\$25000 \times 6 = \$150000$
 $22000 \times 4 = 92000$
 $21500 \times 1 = 21500$
 $22300 \times 7 = 156100$ 419600 , C's prod.;

 $\$30000 \times 7 = \$210000$
 $31800 \times 3 = 95400$
 $26800 \times 8 = 214400$ 519800 , D's prod.;

 $\$1197000$, sum of products.

$$\$15000 \times \frac{2576}{11970} = \$3228.07, \text{ B receives;}$$

$$\$15000 \times \frac{4196}{11970} = 5258.15, \text{ C "}$$

$$\$15000 \times \frac{5198}{11970} = 6513.78, \text{ D "}$$

Ex. 8 C put in $1 - (\frac{1}{2} + \frac{2}{5}) = \frac{1}{10}$ for 1 year; hence

$$\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}, \text{ A's product;}$$

$$\frac{2}{5} \times \frac{1}{2} = \frac{1}{5}, \text{ B's "}$$

$$\frac{1}{10} \times 1 = \frac{1}{10}, \text{ C's "}$$

But $\frac{3}{8}$, $\frac{1}{5}$ and $\frac{1}{10} = \frac{15}{40}$, $\frac{8}{40}$ and $\frac{4}{40}$; and these fractions are proportional to 15, 8 and 4; hence

$$15 + 8 + 4 = 27, \text{ sum of proportional terms;}$$

$$\$5400 \times \frac{15}{27} = \$3000, \text{ A's share of the gain;}$$

$$\$5400 \times \frac{8}{27} = 1600, \text{ B's " " " "}$$

$$\$5400 \times \frac{4}{27} = 800, \text{ C's " " " "}$$

$$\$5400 \times \frac{1}{2} = 2700, \text{ stock A put in;}$$

$$\$5400 \times \frac{2}{5} = 2160, \text{ " B "}$$

$$\$5400 \times \frac{1}{10} = 540, \text{ " C "}$$

$$\$3000 + \$2700 = \$5700, \text{ A's share of entire stock;}$$

$$\$1600 + \$2160 = 3760, \text{ B's " " " "}$$

$$\$800 + \$540 = 1340, \text{ C's " " " "}$$

Ex. 9. $\$456 \div 10 = \$45.60$, A's monthly profit;

$$\$343.20 \div 8 = 42.90, \text{ B's} \quad " \quad "$$

$$\$750 \div 12 = 62.50, C_s \quad " \quad "$$

Now, their respective amounts of capital must be proportional to their monthly profits ; hence

$$\$45.60 + \$42.90 + \$62.50 = \$151;$$

$$\$151 \cdot \$45.60 = \$14345 : (?) = \$4332, \text{ A's capital}$$

\$151 : \$42.90 = \$14345 : (?) = \$4075.50, B's " "

\$151 : \$62.50 = \$14345 : (?) = \$5937.50, C's " "

Ex. 10. C will have $1 - (\frac{1}{10} + \frac{2}{5}) = \frac{1}{2}$ of the profits;

$\frac{1}{10} \div 4 = \frac{1}{40}$, B may claim for 1 mo.;

$\frac{1}{2} \div 8 = \frac{1}{16}, C$ “ “ “ “

$\frac{2}{3} \div 6 = \frac{1}{9}$, D " " " " ; hence

$$\frac{1}{18} : \frac{1}{40} = \$6000 : (?) = \$2250, \text{ B put in ;}$$

$$\frac{1}{18} : \frac{1}{18} = \$6000 : (?) = \$5625, \text{ C} \quad " \quad "$$

Ex. 11. $\$2400 - \$1920 = \$480$, A's gain;

$$\$2080 - \$1280 = 800, \text{ C's } "$$

Now, since the gain varies as the product of the capital and time, we have the compound proportion

$$\left\{ \begin{array}{c} 1920 \\ 6 \end{array} \right. : \left\{ \begin{array}{c} 1280 \\ (?) \end{array} \right. = \$480 : \$800$$

$$(\text{?}) = \frac{1920 \times 6 \times 800}{1280 \times 480} = 15 \text{ mo., C's time.}$$

Again, since A gained \$480 in 6 mo., he would have gained $\$480 \times 2 = \$960$ in 12 mo., B's time; and his stock and gain together would have been $\$1920 + \$960 = \$2880$; hence

$$\text{\$2880} : \text{\$1920} = \text{\$4800} : (?) = \text{\$3200, B's stock.}$$

ALLIGATION.

(633, page 370.)

$$\begin{array}{r}
 \text{Ex. 1. } \$.60 \times 4 = \$2.40 \\
 .70 \times 3 = 2.10 \\
 1.10 \times 1 = 1.10 \\
 1.20 \times 2 = 2.40 \\
 \hline
 10) \$8.00 \\
 \hline
 \text{Ans. } \$80
 \end{array}$$

$$\begin{array}{r}
 \text{Ex. 2. } \$0 \times 14 = \$ 0.00 \\
 .75 \times 12 = 9.00 \\
 .90 \times 24 = 21.60 \\
 1.10 \times 16 = 17.60 \\
 \hline
 66) \$48.20 \\
 \hline
 \text{Ans. } \$73\frac{1}{2}
 \end{array}$$

$$\begin{array}{r}
 \text{Ex. 3. } 3 \text{ lb. 6 oz.} = 42 \text{ oz.}; \quad 23 \times 42 = 966 \text{ carats}; \\
 4 \text{ " } 8 \text{ " } = 56 \text{ " } \quad 21 \times 56 = 1176 \text{ " } \\
 3 \text{ " } 9 \text{ " } = 45 \text{ " } \quad 20 \times 45 = 900 \text{ " } \\
 2 \text{ " } 2 \text{ " } = 26 \text{ " } \quad 0 \times 26 = 0 \text{ " } \\
 \hline
 169) 3042 \text{ " } \\
 \hline
 18 \text{ carats, Ans}
 \end{array}$$

$$\begin{array}{r}
 \text{Ex. 4. } \$1.20 \times 15 = \$18.00 \\
 1.10 \times 5 = 5.50 \\
 .90 \times 5 = 4.50 \\
 .70 \times 10 = 7.00 \\
 \hline
 35) \$35.00 \\
 \hline
 \end{array}$$

worth of 1 bu., \$1.00; \$1.25—\$1=\$.25, *Ans.*

$$\begin{array}{r}
 \text{Ex. 5. } \$.05 \times 17 = \$.85 \\
 .08 \times 51 = 4.08 \\
 .10 \times 68 = 6.80 \\
 .12 \times 17 = 2.04 \\
 \hline
 153 \text{ } \$13.77
 \end{array}$$

$\$13.77 \div 153 = \$.09$, average selling price;
 $\$.09 \div 1.33\frac{1}{2} = \$.0675$, *Ans.*

(370, 371)

Ex. 6. $\$2.70 \times 42 = \$113.40$

$2.85 \times 48 = 136.80$

$3.24 \times 65 = 210.60$

$155 \quad \$460.80, \text{ cost,}$

$\$460.80 \times 1\frac{1}{8} = \$552.96, \text{ to be sold for;}$

$\$552.96 \div 155 = \$3.567\frac{1}{3}, \text{ Ans.}$

Ex. 7. As the degrees and minutes of all the observations are alike, we need to average only the seconds, thus:

$25.4'' + 24.5'' + 27.8'' + 26.9'' + 25.4'' + 24.7''$

$+ 24.2'' + 26.3'' + 25.8'' + 26.7'' = 257.7'';$

$257.7'' \div 10 = 25.77''. \text{ Ans. } 36^\circ 17' 25.77''.$

Ex. 8. Since the third trial is entitled to twice the degree of reliance to be placed upon either of the others, it is equivalent to two trials giving the same result; hence 37 min. 54.16 sec., 1st trial;

$37 \text{ " } 55.56 \text{ " } 2d \text{ "}$

$37 \text{ " } 54.82 \text{ " } 3d \text{ "}$

$37 \text{ " } 54.82 \text{ " } 3d \text{ "}$

$44) 151 \text{ min. } 39.36 \text{ sec.}$

$37 \text{ min. } 54.84 \text{ sec.} = 9^\circ 28' 42.6'', \text{ Ans.}$

(634, page 374.)

Ex. 2. $10 \left\{ \begin{array}{c|c|c} 5 & \frac{1}{5} & 3 \\ 7 & & 2 \\ 12 & \frac{1}{2} & 3 \\ 13 & \frac{1}{3} & 5 \end{array} \right\} \text{ Ans. 3 lb. of the first kind, 2 lb. of the second, 3 lb. of the third, and 5 lb. of the fourth.}$

Ex. 3. $75 \left\{ \begin{array}{c|c|c} 0 & \frac{1}{75} & 40 \\ 60 & & 15 \\ 90 & \frac{1}{15} & 3 \\ 115 & \frac{1}{15} & 3 \end{array} \right\} \text{ Ans. 8 gal. of water to 3 gal. at } \$.60, 3 \text{ gal. at } \$.50, \text{ and 15 gal. at } \$ 1.15$

(371—374)

Ex. 4

$$62\frac{1}{2} \left\{ \begin{array}{c|c|c|c|c|c|c|c} 40 & \frac{1}{22\frac{1}{2}} & & 17\frac{1}{2} & & 17\frac{1}{2} & 35 & 7 \\ & & \frac{1}{2\frac{1}{2}} & & 17\frac{1}{2} & 17\frac{1}{2} & 35 & 7 \\ & \frac{1}{17\frac{1}{2}} & \frac{1}{17\frac{1}{2}} & 22\frac{1}{2} & 2\frac{1}{2} & 25 & 50 & 10 \end{array} \right.$$

Ans. 7 A. from each of the first two tracts, and 10 A. from the other.

Ex. 5

$$45 \left\{ \begin{array}{c|c|c|c|c|c|c|c} 60 & \frac{1}{15} & & & 15 & & 15 & 3 \\ 50 & & \frac{1}{5} & \frac{1}{5} & & 7 & 3 & 10 \\ 42 & & & \frac{1}{3} & & & 5 & 5 \\ 38 & & \frac{1}{7} & & 15 & 5 & 5 & 1 \\ 30 & \frac{1}{15} & & & & & 15 & 3 \end{array} \right.$$

Ans. 3 pt. of the first kind, 2 pt. of the second, 1 pt. of the third, 1 pt. of the fourth and 3 pt. of fifth.

Another Solution

$$45 \left\{ \begin{array}{c|c|c|c|c|c|c|c} 60 & \frac{1}{15} & & & 1 & & 1 & \\ 50 & & \frac{1}{5} & \frac{1}{5} & & 7 & 1 & 8 \\ 42 & \frac{1}{3} & & & 5 & & & 5 \\ 38 & & \frac{1}{7} & & & 5 & & 5 \\ 30 & & & \frac{1}{15} & & & 3 & 3 \end{array} \right.$$

Ans. 1 pt. of first kind, 8 pt. of second, 5 pt. of third, 5 pt. of fourth and 3 pt. of fifth.

Ex. 6.

$$\frac{3}{8} \left\{ \begin{array}{c|c|c|c|c|c|c} 8 & & 24 & 24 & 3 & & \\ & 24 & & 24 & 3 & & \\ \hline 40 & 40 & 120 & 160 & 20 & & \end{array} \right. \begin{array}{l} \text{Ans. 3 lb. at } \frac{3}{4} \\ \text{pure, 3 lb. at } \frac{1}{2} \\ \text{pure, 20 lb. } \frac{9}{10}. \end{array}$$

NOTE.—In the above solution, we multiply the first ratio, 8 : 40, by 8, making 24 : 120. Then by adding, we get 24 : 24 : 160, which reduced gives 3 : 3 : 20.

(635, page 375.)

Ex. 1

$$58 \left\{ \begin{array}{c|c|c|c|c|c|c} 25 & \frac{1}{3} & & 12 & & 4 & 4 \\ 50 & & \frac{1}{8} & & 4 & & 4 \\ 62 & & \frac{1}{4} & & 8 & & 8 \\ 70 & \frac{1}{12} & & 33 & & 11 & 11 \end{array} \right. \begin{array}{l} \text{NOTE.—Divide the} \\ \text{terms in the 3d col} \\ \text{umn by 3, and to} \\ \text{the result add the} \\ \text{terms in the 4th.} \end{array}$$

Ans. 4 gal. of the first two kinds, 8 gal. of the third, and 11 gal. of the fourth.

Ex. 2

$$10 \left\{ \begin{array}{c|c|c|c|c|c|c} 7 & \frac{1}{3} & & 1 & & 5 & 5 \\ 8 & & \frac{1}{2} & & 5 & & 5 \\ 13 & \frac{1}{3} & & 1 & & 5 & 5 \\ 15 & & \frac{1}{8} & & 2 & & 2 \end{array} \right. \begin{array}{l} \text{NOTE.—Multiply the} \\ \text{terms in the third col} \\ \text{umn by 5, and add the} \\ \text{result to the terms in the} \\ \text{fourth column.} \end{array}$$

Ans. 5, 5, 5, and 2.

Ex. 3. *For the first mixture.*

$$70 \left\{ \begin{array}{c|c|c|c|c|c|c} 30 & \frac{1}{10} & & 3 & & 3 & 1 \\ 50 & & \frac{1}{20} & & 3 & & 1 \\ 100 & \frac{1}{30} & \frac{1}{30} & 4 & 2 & 6 & 2 \end{array} \right. \text{Ans. 1, 1, and 2.}$$

For the second mixture.

$$70 \left\{ \begin{array}{c|c|c|c|c|c|c} 30 & \frac{1}{10} & & 3 & & 3 & 1 \\ 50 & & \frac{1}{20} & & 3 & 12 & 12 \\ 100 & \frac{1}{30} & \frac{1}{30} & 4 & 2 & 8 & 12 \end{array} \right. \begin{array}{l} \text{Ans.} \\ 1, 4 \text{ and } 4. \end{array}$$

NOTE.—Multiply the terms in the fourth column by 4, and to the result add the terms in the third column, and then divide by 8.

(636, page 376.)

Ex. 1.

$$22 \left\{ \begin{array}{c|c|c|c|c|c|c} 16 & \frac{1}{8} & & 1 & & 1 & 10 \\ 18 & & \frac{1}{4} & & 1 & & 10 \\ 20 & & & \frac{1}{2} & & 1 & 10 \\ 24 & \frac{1}{2} & \frac{1}{2} & \frac{1}{2} & 3 & 2 & 1 \end{array} \right. \begin{array}{l} \text{Ans. 10 at} \\ \$16, 10 \text{ at } \$18 \\ \text{and } 60 \text{ at } \$24. \end{array}$$

Ex. 2. $\$15 + 12 = \$1\frac{1}{4}$, price per yard of the ingredient whose quantity is limited.

$$1\frac{1}{2} \left\{ \begin{array}{c|c|c|c|c|c|c} \frac{3}{4} & \frac{20}{9} & \frac{20}{9} & 1 & 11 & 12 & 4 \\ \frac{1}{4} & 20 & & 9 & & 9 & 3 \\ \frac{1}{4} & & \frac{20}{11} & & 9 & 9 & 3 \end{array} \right. \begin{array}{l} \text{Ans. 16 yd.} \\ \text{at } \$\frac{3}{4}, \text{ and } 12 \\ \text{yd. } \$1\frac{1}{4} \end{array}$$

(375, 376)

Ex. 3. 9 gal. 2 qt. 1 pt.=77 pt.

$$84 \left\{ \begin{array}{c|c|c|c} 0 & \frac{1}{84} & 1 & 11 \\ 96 & \frac{1}{12} & 7 & 77 \end{array} \right. \text{Ans. 11 pt.}=1 \text{ gal. 1 qt. 1 pt.}$$

$$\text{Ex. 4. } 45 \left\{ \begin{array}{c|c|c|c|c|c|c|c} 30 & \frac{1}{15} & \frac{1}{15} & 2 & 5 & 10 & 15 & 60 \\ 55 & \frac{1}{11} & & 3 & & 15 & 15 & 60 \\ 70 & & \frac{1}{21} & & 3 & & 3 & 12 \end{array} \right. \text{Ans. 60 lb.}$$

(637, page 377.)

Ex. 1. $\$2.20 \times 7 = \$15.40$

$\$2.00 \times 7 = 14.00$

$14 \) \ \$29.40$

$\$2.10$, average price of the 14 yd.

$$180 \left\{ \begin{array}{c|c|c|c|c|c|c|c} 160 & \frac{1}{20} & & 3 & 3 & 1 & 14 & \text{Ans. 14 yd} \\ 175 & & \frac{1}{5} & 6 & 6 & 2 & 28 & \text{at \$1.60, and} \\ 210 & \frac{1}{30} & \frac{1}{30} & 2 & 1 & 3 & 14 & 28 \text{ yd. \$1.75} \end{array} \right.$$

Ex. 2. $\$1.14 \times 60 = \$68.40$

$\$1.26 \times 30 = 37.80$

$90 \) \ \$106.20$

$\$1.18$, average price of the 90 gal.

$$157 \left\{ \begin{array}{c|c|c|c} 118 & \frac{1}{39} & 18 & 90 \\ 175 & \frac{1}{18} & 39 & 195 \end{array} \right. \text{Ans. 195 gal.}$$

Ex. 3. $\$2.00 \times 40 = \$80$

$\$.50 \times 70 = 35$

$110 \) \ \$115$

$\$ 1\frac{1}{2}$, average price of the 110 bu.

$$1 \left\{ \begin{array}{c|c|c|c} \frac{1}{27} & \frac{4}{22} & 4 & 2 \\ 1\frac{1}{27} & \frac{4}{22} & 66 & 33 \end{array} \right. \text{Ans. } 6\frac{2}{3} \text{ bu.}$$

NOTE.—Multiply the terms in the fourth column by $\frac{1}{33} = \frac{1}{3}$.

(376, 377)

(638, page 378.)

Ex. 1.
$$20 \left\{ \begin{array}{c|c|c|c|c|c|c} 8 & \frac{1}{12} & & 1 & 1 & 40 & \\ 16 & & & & 1 & 40 & \\ 24 & \frac{1}{4} & \frac{1}{4} & 3 & 1 & 4 & 160 \\ & & & & & - & \\ & & & & & 6 & 240 \end{array} \right. \begin{array}{l} \text{Ans. 40 lb. at 8} \\ \text{cts., 40 lb. at 16} \\ \text{cts., and 160 lb.} \\ \text{at 24 cts.} \end{array}$$

Ex. 2. $\$154 \div 154 = \$1$, average price.

$$1 \left\{ \begin{array}{c|c|c|c|c|c|c} & 1 & & & & & \\ 3\frac{1}{2} & \frac{1}{2} & & 1 & & & \\ & 2\frac{1}{2} & & & & & \\ 1\frac{1}{3} & & 3 & & 1 & 14 & \\ & 2 & 2 & 5 & 3 & 42 & \\ & & & & 7 & 98 & \\ & & & & - & - & \\ & & & & 11 & 154 & \end{array} \right. \begin{array}{l} \text{Ans. 14 calves, 42} \\ \text{sheep, and 98 lambs} \end{array}$$

Ex. 3. $\$165 \div 55 = \$3$, average weekly wages.

$$3 \left\{ \begin{array}{c|c|c|c|c|c|c} 5 & \frac{1}{2} & \frac{1}{2} & 5 & 1 & 6 & 30 \\ 1 & & & & 1 & 1 & 5 \\ & 1 & & & & & \\ \frac{1}{2} & - & & 4 & & 4 & 20 \\ & 2\frac{1}{2} & & & & - & \\ & & & & & 11 & 55 \end{array} \right. \begin{array}{l} \text{Ans. 30 men, 5} \\ \text{women, and 20 boys.} \end{array}$$

INVOLUTION.

(644, page 380.)

Ex. 3. *Ans.* 2102500**Ex. 13.** *Ans.* 2023.37890625**Ex. 14.** *Ans.* 3838.28125**Ex. 16.** *Ans.* $1871688\frac{7}{11}$

(378—380)

EVOLUTION.

SQUARE ROOT.

(657, page 385.)

Ex. 3. *Ans.* 7502; 24.4315+.

Ex. 9. $99225 - 63504 = 35721$; $\sqrt{35721} = 189$, *Ans.*

Ex. 10. $\sqrt{.126736} = .356$; $\sqrt{.045369} = .213$;
 $.356 - .213 = .143$, *Ans.*

Ex. 11. $\sqrt{\frac{169}{196}} = \frac{\sqrt{169}}{\sqrt{196}} = \frac{13}{14}$; $\sqrt{\frac{7056}{9216}} = \frac{\sqrt{7056}}{\sqrt{9216}} = \frac{84}{96}$;
 $\frac{13}{14} \times \frac{84}{96} = \frac{13}{16}$, *Ans.*

Ex. 12. $\sqrt{81^2 \times 625^2 \times 2^4} = 81 \times 625 \times 2^2 = 202500$, *Ans.*

CONTRACTED METHOD.

(658, page 386.)

Ex. 1.	$\overline{)5.6568542+}$, <i>Ans.</i>	Ex. 2.	$\overline{)3.4641016+}$, <i>Ans.</i>
	32.000000		12.000000
	25		9
106	<u>7.00</u>	64	<u>300</u>
	936		256
1125	<u>6400</u>	686	<u>4440</u>
	5625		4116
11806	<u>77500</u>	6924	<u>28400</u>
	67836		27696

(385-387)

11312	9664	6928	704
	9050		693
1131	614	693	11
	566		7
113	48	7	4
	45		4
11	3		
	2		

Ex. 3. $\sqrt{57.3322+}$, Ans.

	3286.9835
	25
107	786
	749

1143	3798
	3429

1146	369
	344

115	25
	23

12	2
	2

Ex. 4. $\sqrt{.745355+}$, Ans.

.5=	.555555+
	49
144	655
	576

1485	7955
	7425

1490	530
	447

149	83
	75

15	8
	8

Ex. 5. $\sqrt{2.563479+}$, Ans.

64=	6.571428+
	4
45	257
	225

Ex. 6. $\sqrt{1.156817+}$ Ans.

1.065=	1.338226+
	1
21	33
	21

506	3214
	3036
5123	17828
	15369
5126	2459
	2050
513	409
	359
51	50
	46

Ex. 7. $1.0125^3 = 1.0380 +$
 $|1.0188 +, Ans.$
 $1.0380 +$
 1

201	380
	201
202	179
	162
20	17
	16

225	1282
	1125
2306	15726
	13836
2312	1890
	1850
231	40
	28
23	17
	16

Ex. 8. $|1.011620 \pm, Ans$
 1.023375
 1

201	0233
	201
2021	3275
	2021
2022	1254
	1213
202	41
	40
20	1

CUBE ROOT.

(661, page 392.)

Ex. 9. $\sqrt[3]{134217728} = 512$; $\sqrt[3]{512} = 8, Ans.$

Ex. 10. $39304^2 = 1544804416$; $\sqrt[3]{1544804416} = 1156, Ans$

(387-392)

Ex. 11. $\sqrt[3]{\frac{648}{3000}} = \sqrt[3]{\frac{27}{125}} = \frac{3}{5}$; $\sqrt[3]{\frac{1331}{3179}} = \sqrt[3]{\frac{121}{289}} = \frac{11}{17}$;
 $\frac{3}{5} \times \frac{11}{17} = \frac{33}{85}$, Ans.

Ex. 12. $\sqrt[3]{56} = 3.6840 +$
 $\sqrt[3]{31} = 3.1413 +$

 $6.8253 +$, sum of cube roots;
 $\sqrt[3]{56+31} = \sqrt[3]{87} = 4.3267 +$, cube root of sum;

 $2.4986 +$, Ans.

CONTRACTED METHOD.

(622, page 394.)

Ex. 1		<u>2.8844992 ±, Ans</u>	
		24.000000	
		8	
68	544	1200	16000
		1744	13952
848	6784	235200	2048000
		241984	1935872
864	346	248832	112128
		249178	99671
0	4	24952	12457
		24956	9982
		2496	2475
			2246
		250	229
			225
		25	4
			5

(392—394)

Ex. 2.

Ans, |22.894801334-12000.812161

8

62	124	1200	4000
		1324	2648
668	5344	145200	1352812
		150544	1204352
6849	61641	15595200	148460161
		15656841	140911569
6867	2747	15718563	7548592
		15721310	6288524
69	55	1572406	1260068
		1572461	1257969
		157252	2099
			1573
		1573	526
			472
		157	54
			47
		16	7
			6

Ex. 3

|.555554780±, Ans..171467000

125

155	775	7500	46167
		8275	41375
1655	8275	907500	5092000
		915775	4578875

(394)

1665	833	924075	513125
		924908	462454
17	9	92574	50671
		92583	46292
		9259	4379
			3704
		926	675
			648
		93	27
			27
		9	0

Ex. 4.

[1.34442±, Ans

2.429990

1

83	99	300	1429
		399	1197
394	1576	50700	232990
		52276	203104
		53868	23886
402	161	54029	21612
		5419	2274
4	2	5421	2168
		542	106
			108

Ex. 5.

[2.6888±, Ans

19.410

8

66	896	1200	11440
		1596	9576

(394)

EVOLUTION.

78	60	2028	1864
		2088	1670
1	1	215	194
		216	173
		22	21
			18
		2	8

Ex. 6.

.941035±, Ans.
 $\frac{1}{2} = \frac{.833333}{729}$

274	1096	24300	104333
		25396	101584
282	28	26508	2749
		26536	2654
		2656	95
			80
		27	15
			14

Ex. 7.

.829826686±, Ans.
 $\frac{.571428888}{512}$

242	484	19200	59428
		19684	39368
2469	22221	2017200	20060888
		2039421	18354789
2487	1990	2061723	1706099
		2063713	1650970
25	5	206570	55129
		206575	41315

20658	13814
	12395
2066	1419
	1240
207	179
	166
21	13
	13

Ex. 8.

$$1.08674325^3 = \frac{1.057023 \pm, \text{Ans.}}{1.181011 \pm 1}$$

		30000	181011
805	1525	31525	157625
		33075	23386
815	221	33296	23307
		3352	79
			67
		34	12
			10

Ex. 9.

$$1.05^3 = \frac{1.084715 \pm, \text{Ans.}}{1.276282 1}$$

		30000	276282
808	2464	32464	259712
		34992	16570
824	130	35122	14049
		3525	2521
8	2	3527	2469
		353	52
			85
		35	17
			18

ROOTS OF ANY DEGREE.

(664, page 395.)

Ex 1. $6=3 \times 2$; $\sqrt[3]{6321363049}=1849$; $\sqrt{1849}=43$

Ex. 2. $4=2 \times 2$; $\sqrt{5636405776}=75076$;
 $\sqrt{75076}=274$, *Ans.*

Ex. 3. $8=2 \times 2 \times 2$; $\sqrt{1099511627776}=1048576$;
 $\sqrt{1048576}=1024$; $\sqrt{1024}=32$, *Ans.*

Ex. 4. $6=3 \times 2$; $\sqrt{25632972850442049}=160103007$;
 $\sqrt[3]{160103007}=543$, *Ans.*

Ex 5. $9=3 \times 3$; $\sqrt{1.577635}=1.164132+$;
 $\sqrt{1.164132}=1.051963+$, *Ans.*

Ex. 6. $12=2 \times 2 \times 3$; $\sqrt[3]{16.3939}=2.5404+$;
 $\sqrt{2.5404}=1.5938+$; $\sqrt{1.5938}=1.2624+$, *Ans.*

Ex. 7. $18=2 \times 3 \times 3$; $\sqrt{104.9617}=10.24508+$;
 $\sqrt[3]{10.24508}=2.171893+$;
 $\sqrt[3]{2.171893}=1.2950+$, *Ans.*

(665, page 397.)

Ex. 2. $\sqrt{120}=3.31+$; $\sqrt{120}=2.22+$;
 $3.31+2.22=5.53$; $5.53 \div 2=2.76$, assumed root;
 $2.76^4=58.06+$; $120 \div 58.06=2.0669+$;
 $2.76 \times 4+2.0669=13.1069$;
 $13.1069 \div 5=2.6214$, 1st approximation.

 $2.6214^4=47.2203+$; $120 \div 47.2203=2.54128+$;
 $2.6214 \times 4+2.54128=13.02688$;
 $13.02688 \div 5=2.60537$, 2d approximation.

 $2.60537^4=46.07627+$; $120 \div 46.07627=$

(395—397)

$2.604378+$; $2.60537 \times 4 + 2.604378 = 13.025858$;
 $13.025858 \div 5 = 2.605171$, 3d approximation, which
 is correct to the last decimal place.

Ex. 3 $\sqrt[5]{1.95678} = 1.11838+$; $\sqrt[5]{1.95678} = 1.08292+$;
 $1.11838 + 1.08292 = 2.20130$;
 $2.20130 \div 2 = 1.10065$, assumed root;
 $1.10065^6 = 1.77785129+$; $1.95678 \div 1.77785129 =$
 $1.10064324+$; $1.10065 \times 6 + 1.10064324 =$
 7.70454324 ; $7.70454324 \div 7 = 1.10064903$, 1st ap-
 proximation, correct to the last decimal place.

Ex. 4. $10 = 2 \times 5$; $\sqrt[5]{743044} = 862$.
 Take 4 = the assumed 5th root of 862; then
 $4^4 = 256$; $862 \div 256 = 3.36$; $4 \times 4 + 3.36 = 19.36$;
 $19.36 \div 5 = 3.872$, 1st approximation.

 $3.872^4 = 224.771579$; $862 \div 224.771579 =$
 $3.83500443+$; $3.872 \times 4 + 3.83500443 =$
 19.32300443 ; $19.32300443 \div 5 = 3.8646008$, 2d
 approximation, *Ans.*

Ex. 5. $15 = 3 \times 5$; $\sqrt[5]{15} = 2.466212+$.
 Take 1.2 = the assumed 5th root of 2.466212; then
 $1.2^4 = 2.0736$; $2.466212 \div 2.0736 = 1.189339+$;
 $1.2 \times 4 + 1.189339 = 5.989339$;
 $5.989339 \div 5 = 1.197868$, 1st approximation.

 $1.197868^4 = 2.058898+$; $2.466212 \div 2.058898 =$
 $1.197831+$; $1.197868 \times 4 + 1.197831 = 5.989303$;
 $5.989303 \div 5 = 1.197861$, 2d approximation, correct
 to the last place; hence *Ans.*, 1.197861+.

Ex. 6. Since $25 = 5 \times 5$, we might extract the 5th root of
 the 5th root, for the 25th root. A more convenient
 method is as follows:

$$\sqrt{100}=10;$$

$$\sqrt[3]{100}=\sqrt[3]{10}=3.1622+;$$

$$\sqrt[4]{100}=\sqrt[4]{3.1622}=1.7782+;$$

$$\sqrt[5]{100}=\sqrt[5]{1.7782}=1.2115+.$$

Now, as the 25th root must be less than the 24th root, take 1.2=the assumed root.

$$1.2^{24}=79.49684+; 100\div 79.49684=1.25792+;$$

$$1.2\times 24+1.25792=30.05792;$$

$$30.05792\div 25=1.2023168, \text{ 1st approximation.}$$

$$1.2023168^{24}=83.2677184+; 100\div 83.2677184=$$

$$1.2009492+; 1.2023168\times 24+1.2009492=$$

$$30.0565524; 30.0565524\div 25=1.202262+,$$

Ans., correct to 5 decimal places.

Ex 7. $\sqrt{5}=1.5+; \sqrt[3]{5}=1.3+; 1.5+1.3=2.8;$

$$2.8\div 2=1.4, \text{ assumed root}$$

$$1.4^4=3.8416; 5\div 3.8416=1.3016+; 1.4\times 4+$$

$$1.3016=6.9016;$$

$$6.9016\div 5=1.38032, \text{ 1st approximation.}$$

$$1.38032^4=3.63011+; 5\div 3.63011=1.37721+;$$

$$1.38032\times 4+1.37721=6.89849;$$

$$6.89849\div 5=1.37970+, \text{ *Ans.*}$$

SERIES.

GENERAL PROBLEMS IN ARITHMETICAL PROGRESSION

(677, page 400.)

Ex. 1. $(8-1) \times 4 = 28$; $28 + 5 = 33$, *Ans.*

Ex. 2. $(50-1) \times 3 = 147$; $147 + 2 = 149$, *Ans.*

Ex. 3. $(13-1) + 7 = 84$; $100 - 84 = 16$, *Ans.*

Ex. 4. $(20-1) \times \frac{3}{8} = 7\frac{1}{8}$; $7\frac{1}{8} + \frac{2}{8} = 7\frac{3}{8}$, *Ans.*

(678, page 401.)

Ex. 1. $(15-3) \div (7-1) = 2$, *Ans.*

Ex. 2. $(51-1) \div (76-1) = \frac{2}{3}$, *Ans.*

Ex. 3. $.1 - .05 = .05$; $8 - 1 = 7$; $.05 \div 7 = .00714285$, *Ans.*

Ex. 4. $2\frac{1}{2} \div 17 = \frac{5}{34}$, *Ans.*

(679, page 401.)

Ex. 1. $75 - 5 = 70$; $70 \div 5 = 14$; $14 + 1 = 15$, *Ans.*

Ex. 2. $20 - \frac{1}{2} = 19\frac{1}{2}$; $19\frac{1}{2} \div 6\frac{1}{2} = 3$; $3 + 1 = 4$, *Ans.*

Ex. 3. $2.5 - .25 = 2.25$; $2.25 \div .125 = 18$; $18 + 1 = 19$, *Ans.*

Ex. 4. If there are 5 means, there will be $5 + 2 = 7$ terms
Hence $37 - 2 = 35$; $35 \div 6 = 5\frac{5}{6}$, common difference.
Ans. 2, $7\frac{5}{6}$, $13\frac{2}{3}$, $19\frac{1}{2}$, $25\frac{1}{3}$, $31\frac{1}{6}$, 37.

(680, page 402.)

Ex. 1. $40 - 4 = 36$; $36 \div 6 = 6$; $6 + 1 = 7$, number of terms;
 $(40 + 4) \times \frac{7}{2} = 154$, *Ans.*

Ex. 2. $250 \times 125 = 125000$, *Ans.*

Ex. 3. 11 = No. terms; 220 = last term; 17 = com. diff.;
 $(11-1) \times 17 = 170$; $\$220 - \$170 = \$50$, first term
 $(\$220 + \$50) \times \frac{1}{2} = \$1485$.

GENERAL PROBLEMS IN GEOMETRICAL PROGRESSION

(682, page 403.)

Ex. 1. $6 \times 4^5 = 6144$, *Ans.* Ex. 2. $192 + 2^6 = 3$, *Ans.*

Ex. 3. $6 \times \frac{1}{8^7} = \frac{2}{3^6} = \frac{2}{729}$, *Ans.*

Ex. 4. $25 \times \frac{1}{5^4} = \frac{25}{5^4} = \frac{5^2}{5^4} = \frac{1}{25}$, *Ans.*

(683, page 404.)

Ex. 1. $512 \div 2 = 256$; $\sqrt[4]{256} = 4$, *Ans.*

Ex. 2. $45\frac{9}{16} \div \frac{1}{48} = 2187$; $\sqrt[3]{2187} = 3$, *Ans.*

Ex. 3. $7 \div .0112 = 625$; $\sqrt[3]{625} = 5$, *Ans.*

Ex. 4. $5000 \div 8 = 625$; $\sqrt[3]{625} = 5$, ratio;
Ans. 8, 40, 200, 1000, 5000.

(684, page 404.)

Ex. 1. $1458 \div 2 = 729$

$$\begin{array}{r|l} 3 & 729 \\ \hline 3 & 243 \\ \hline 3 & 81 \\ \hline 3 & 27 \\ \hline 3 & 9 \\ \hline 3 & 3 \\ \hline & 1 \end{array} \quad \text{Ans. 7.}$$

Ex. 2. $100 \div .1 = 1000$

$$\begin{array}{r|l} 10 & 1000 \\ \hline 10 & 100 \\ \hline 10 & 10 \\ \hline & 1 \end{array} \quad \text{Ans. 4}$$

Ex. 3. $\frac{1}{8} \div \frac{1}{810} = 128$

$$\begin{array}{r|l} 2 & 128 \\ \hline 2 & 64 \\ \hline 2 & 32 \\ \hline 2 & 16 \\ \hline 2 & 8 \\ \hline 2 & 4 \\ \hline 2 & 2 \\ \hline & 1 \text{ Ans. 8.} \end{array}$$

Ex. 4. $196608 \div 6 = 32768$

$$\begin{array}{r|l} 8 & 32768 \\ \hline 8 & 4096 \\ \hline 8 & 512 \\ \hline 8 & 64 \\ \hline 8 & 8 \\ \hline & 1 \text{ Ans. 6} \end{array}$$

(685, page 405.)

Ex. 1. $384 \times 2 = 768$; $768 - 3 = 765$; $765 \div 1 = 765$, Ans.

Ex. 2. $1080 \times 6 = 6480$; $6480 - 5 = 6475$;
 $6475 \div 5 = 1295$, Ans.

Ex. 3. $4\frac{4}{5} \times 3 = 14\frac{2}{5}$; $14\frac{2}{5} - \frac{8}{5} = 14\frac{4}{5}$;
 $14\frac{4}{5} \div 2 = 7\frac{2}{5}$, Ans.

Ex. 4. The least extreme is 0, and the ratio is $8 \div 4 = 2$;
hence, $8 \times 2 = 16$, Ans.

(686, page 405.)

Ex. 1. $3^4 = 81$; $81 - 1 = 80$; $80 \times 7 = 560$;
 $560 \div 2 = 280$, Ans

Ex. 2. $375 \div 5^3 = 3$, least term; $5^4 = 625$; $625 - 1 = 624$;
 $624 \times 3 = 1872$; $1872 \div 4 = 468$, Ans.

Ex. 3. $1.06^5 = 1.338226 +$; $175 \times 338226 =$
 59.189550 ; $59.18955 \div .06 = 986.49 +$, Ans.

(687, page 406.)

Ex. 1. $800 - 2 = 798$; $800 - 686 = 114$; $798 \div 114 = 7$, *Ans.*

Ex. 2. $127\frac{3}{4} - \frac{1}{4} = 127\frac{1}{2}$; $127\frac{3}{4} - 64 = 63\frac{3}{4}$;
 $127\frac{1}{2} \div 63\frac{3}{4} = 2$, *Ans.*

Ex. 3. $4\frac{1}{2} - 0 = 4\frac{1}{2}$; $4\frac{1}{2} - 3 = 1\frac{1}{2}$; $1\frac{1}{2} \div 4\frac{1}{2} = \frac{1}{3}$, *Ans.*

COMPOUND INTEREST BY GEOMETRICAL PROGRESSION

(689, page 407.)

Ex. 1. $\$350$ = first term, 5 = number of terms, and
 1.06 = ratio; the last term is required.
 $\$350 \times 1.06^4 = \$441.86+$, *Ans.*

Ex. 2. To find the compound interest of $\$1$, we have $\$1$ =
first term, 1.07 = ratio, 3 = No. terms;
 $\$1 \times 1.07^2 = \$1.1449$, amount;
 $\$1.1449 - \$1 = \$.1449$, int. of $\$1$;
 $\$.150 \div .1449 = \$1035.196+$, *Ans.*

Ex. 3. We have given $\$1000$ = last term, 1.06 = ratio, 4 =
No. terms, to find the first term. Reversing the rule,
 $\$1000 \div 1.06^3 = \$839.62-$, *Ans.*

Ex. 4. $\$40$ = first term; $\$53.24$ = last term; 1.10 = ratio.
We find the number of terms by Prob. III, thus:
 $53.24 \div 40 = 1.331$; $1.331 \div 1.10 = 1.21$; $1.21 \div$
 $1.10 = 1.10$; $1.10 \div 1.10 = 1$.
Hence $3 + 1 = 4$ = No. terms; and *Ans.*, 3 years.

Ex. 5. Let the principal be $\$1$; then 1 = first term;
2 = last term; 9 = No. terms. We find the ratio by
Prob. II, thus: $2 \div 1 = 2$; $\sqrt[9]{2} = 1.0905+$;
 $1.0905 - 1 = .0905 = 9.05\%$, *Ans.*

- Ex. 6.** \$322.51 = last term, 1.05 = ratio, 25 = No. terms.
We find the first term by Prob. I, thus: $1.05^{25} = 3.225100 +$; $\$322.51 \div 3.2251 = \$100$, *Ans.*
-

ANNUITIES AT SIMPLE INTEREST

(697, page 409.)

- Ex. 3.** \$150 = the last term; $\$150 \times .015 = \$2.25$ = common difference; $5\frac{1}{2} \times 4 = 22$ = No. terms. We find the sum of the series by 677 and 680, thus:
 $\$150 + (\$2.25 \times 21) = \$197.25$, first term;
 $\$197.25 + \$150$
 $\frac{\quad}{2} \times 22 = \$3819.75$, *Ans.*

- Ex. 4.** \$500 = last term, \$3450 = sum of series, $\$500 \times .06 = \$30$ = common difference; we are required to find the number of terms. Now $3450 \div 500 = 6.9$; that is, if the pension did not draw interest, the time required for it to amount to the given sum would be less than 7 yr.; by trial we find the time to be 6 yr.

- Ex. 5.** \$6000 = last term; \$59760 = the sum of the series; 8 = No of terms. We find the common difference, thus: according to 680, 2 times the sum of the series = the sum of the extremes multiplied by the number of terms. Therefore
 $\$59760 \times 2$
 $\frac{\quad}{8} = \$14940$, the sum of the extremes:

\$14940 — \$6000 = \$8940, first term. Hence by 678, $\$8940 - \$6000 = \$2940$; $\$2940 \div 7 = \$420$, common difference. Then
 $\$420 \div \$6000 = .07 = 7\%$, *Ans.*

PROMISCUOUS EXAMPLES IN SERIES.

(700, page 411.)

- Ex. 1.** Its present amount will be the sum of the geometrical series in which \$200 = first term; 1.06 = ratio, and 20 = No terms. Hence, by **686**,

$$\frac{200 \times (1.06^{20} - 1)}{1.06 - 1} = \frac{200 \times 2.207135 +}{.06} = \$7357.11 +.$$

- Ex. 2.** We have given \$16459.35 = sum of the series, 25 = No. of terms, 1.06 = ratio, to find the first term. According to **686**, the sum of the series is equal to

$$\frac{1.06^{25} - 1}{1.06 - 1};$$

the first term multiplied by the fraction $\frac{1.06^{25} - 1}{1.06 - 1}$;

consequently the first term will be found by *dividing* the sum of the series by the same fraction; and we

$$\text{have } \$16459.35 \times \frac{1.06 - 1}{1.06^{25} - 1} = \frac{\$987.5613}{3.291871} = \$300.$$

- Ex. 3** We first find the amount of the annuity in arrears for the 7 years. We have given \$500 = first term, 1.06 = ratio, and 7 = No. terms. Hence by **686**,

$$\frac{\$500 \times (1.06^7 - 1)}{1.06 - 1} = \frac{\$251.815}{.06} = \$4196.91\frac{2}{3}, \text{ sum of}$$

series. We now find, by **553**, what sum will amount to \$4196.91 $\frac{2}{3}$ in 7 years, at 6% compound interest; thus: \$4196.91 $\frac{2}{3}$ $\div$ 1.503630 = \$2791.18 +.

- Ex. 4.** We first find the value of the annuity in arrears for the 20 years, or its worth when it expires. We have given \$100 = first term, 20 = No. terms, and 1.05 = ratio, to find the sum of the series. By **686**,

$$\frac{\$100 \times (1.05^{20} - 1)}{1.05 - 1} = \$3306.596, \text{ sum of series.}$$

This is what the lease is worth $20 + 14 = 34$ years hence; therefore its present value, by **553**, is $\$3306.596 \div 5.253348 = \$629.426$, *Ans.*

Ex. 5. $21 =$ No. terms, $5 =$ first term, $\frac{1}{4} =$ common diff
By **677**, $5 - (\frac{1}{4} \times 20) = 0$, last term;
by **680**, $\frac{0 + 5}{2} \times 21 = 52\frac{1}{2}$, *Ans.*

Ex. 6. $80 =$ last term, $5 =$ common diff., $13 =$ No. terms; to find the first term, and the sum of the series.
Reversing the rule under **677**, we have $(13 - 1) \times 5 = 60$; $80 - 60 = 20$, first day's journey. Then by **680**, $\frac{20 + 80}{2} \times 13 = 650$, whole distance traveled.

Ex. 7. $15 \div 30 = \frac{1}{2}$, the ratio; by **682**, $30 \times \frac{1}{102\frac{1}{2}} = \frac{1}{2\frac{1}{4}}$, *Ans.*

Ex. 8. By **685**, $\frac{(51\frac{1}{2} \times 4) - 2}{4 - 1} = \frac{204\frac{1}{2}}{3} = 68\frac{1}{6}$, *Ans.*

Ex. 9. We have given $360 =$ sum of an arithmetical series, $27 =$ first term, and $45 =$ last term, to find the number of terms. By **680**, twice the sum of the series is equal to the sum of the extremes multiplied by the number of terms; conversely, $\frac{360 \times 2}{27 + 45} = 10$, *Ans.*

Ex. 10. By **683**, $\sqrt[3]{15625} = 5$, *Ans.*

Ex. 11. $\$500 =$ first term, $10 =$ No. terms, $1.06 =$ ratio; to find the sum of the series. By
$$\frac{\$500 \times (1.06^{10} - 1)}{1.06 - 1} = \frac{\$395.424}{.06} = \$6590.40, \text{ Ans.}$$

Ex. 12. Reversing the rule under **680**, we have $\frac{108 + 2}{2} = 102$, the sum of the extremes. Now, since 6 is the common difference, and 8 the number of terms, $(8 - 1)$

$\times 6 = 42$ is the difference of the extremes; hence by Prob. 33, **127**, $\frac{10^2 + 4^2}{2} = 72$, last term; and $\frac{10^2 - 4^2}{2} = 30$, first term.

Ex. 12. We have \$1196 = the sum of an arithmetical series, 13 = No. of terms, and \$12 = the common difference, to find the first and last terms. Proceeding as in the last example, $\frac{11.96 \times 2}{3} = \$184$, the sum of the extremes; $(13 - 1) \times 12 = \$144$, the difference of the extremes. $\frac{\$184 - \$144}{2} = \$20$, first payment; $\frac{\$184 + \$144}{2} = \$164$, last payment.

Ex. 14. \$2 = first term of a geometrical series, \$512 = last term, and 4 = ratio; to find the number of terms, and the sum of the series.

First, by **684**, $512 \div 2 = 256$; $256 \div 4 = 64$; $64 \div 4 = 16$; $16 \div 4 = 4$; and $4 \div 4 = 1$. Hence $4 + 1 = 5$, number of payments.

Second, by **685**, $(\frac{5 \times 1^2 \times 4}{1}) - 2 = \$682$, indebtedness.

Ex. 15. \$4800 = first term, 5 = No. terms, $1\frac{1}{2}$ = ratio; to find the last term, and the sum of the series.

By **682**, $\$4800 \times (1\frac{1}{2})^4 = \$24300$, share of eldest;
 $(\$24300 \times 1\frac{1}{2}) - \$4800$

By **685**, $\frac{\quad}{1\frac{1}{2} - 1} = \$63300$, property

Ex. 16. \$2818.546 = sum of series, 5 = No. terms, 1.06 = ratio; to find the first term. Reversing the rule under **686**, as in Ex. 2, we have

$$\$2818.546 \times \frac{1.06 - 1}{1.06^5 - 1} = \frac{\$169.11276}{.338226} = \$500, \text{ Ans.}$$

Ex. 17. \$10 = first term, \$7290 = last term, 3 = ratio, to find the number of terms, and the sum of the series

By **684**, $7290 \div 10 = 729$; $729 \div 3 = 243$;

$$243 \div 3 = 81; 81 \div 3 = 27; 27 \div 3 = 9; 9 \div 3 = 3;$$

$$3 \div 3 = 1; 6 \div 1 = 7, \text{ payments.}$$

$$\text{By } \mathbf{685}, (91290 \times 3) - 210 = \$10930, \text{ debt.}$$

Ex. 18. If we take the distance traveled in going to the several stations and returning, we shall have an arithmetical series, of which 10 mi. = the first term, 50 mi. = the last term, and 180 mi. = the sum. We are to find the number of terms and the common difference. Reversing rule under **680**, we have $\frac{180 \times 2}{10 + 50} = 6$, No. stations. And reversing rule under **677**, $\frac{50 - 10}{6 - 1} = 8$, common difference; hence $8 \div 2 = 4$ mi., distance between the stations.

Ex. 19. We first find the amount of the annuity in arrears for 12 years, by **686**,

$$\frac{\$200 \times (1.06^{12} - 1)}{1.06 - 1} = \$3373.99 +, \text{ amount.}$$

Since this will be the value of the annuity when it expires, we must find its present worth, at 6% compound interest for $6 + 12 = 18$ years. By **553**, $\$3373.99 \div 2.854339 = \$1182.05 +$, *Ans.*

Ex. 20. We have a geometrical series, in which \$6 = first term, 1.06 = ratio, and $60 - 16 = 44 =$ No. terms.

$$\begin{aligned} & \$6 \times (1.06^{44} - 1) \\ \text{Hence, } & \frac{\quad}{1.06 - 1} = \$1198.548, \text{ saved by dis-} \\ & \text{pensing with tobacco; and } \$1198.544 + \$500 = \\ & \$1698.548, \text{ } \textit{Ans.} \end{aligned}$$

Ex. 21. The value of a perpetuity when entered upon, is a sum whose annual interest = the perpetuity; hence $\$100 \div .05 \% = \$2000$, value when entered upon

Since this is the value 30 years hence, we find its present value by **553**, thus:

$$\$2000 \div 4.321942 = \$462.75+, \text{ Ans.}$$

- Ex. 22.** *First*; \$2000 is the amount of a certain sum at simple interest $21-12=9$ years at 7%. That is, \$2000 is the last term of an arithmetical series, .07 times the first term is the common difference, and $9+1$ is the number of terms; and from these data we are to find the first term. Assuming a series of which \$1 is the first term, \$.07 the common difference, and 10 the number of terms, by **679**, we find the last term to be $\$1 + (\$.07 \times \overline{10-1}) = \$1.63$. Now, since \$1.63 is the last term of an arithmetical series of which \$1 is the first term, \$2000 must be the last term of a similar series, the first term of which is $\$2000 \div 1.63 = \$1226.993+$, the sum left at 7% simple interest.

Second; \$2000 is the sum of a geometrical series, 1.03 is the ratio, and $(21-12 \times 2) + 1 = 19$ is the number of terms; and we are required to find the first term. By **682**, we have $\$2000 \div 1.03^{19-1} = \$2000 \div 1.702433 = \$1174.789+$, the sum left at 6% compound interest payable semi-annually.

- Ex. 23.** The prices of the several pieces form an arithmetical series, of which \$136= sum, \$4=the com. diff., \$31=the last term, and 8=the No. terms. By **677**, $31 - (\overline{8-1} \times 4) = 3$, first term, or the value of the the first piece; and as the price of this piece was \$1 per yard, $\$3 \div \$1 = 3$ yards in the first piece. Now, the number of yards in the several pieces form a series, the first term of which is 3, the common difference is 2, and the number of terms is 8. Hence,

$8+2(8-1)=17$ yd. in longest piece;

$\frac{17+8}{2} \times 8 = 80$ " whole quantity.

We now have 3 yd., 5 yd., 7 yd., 9 yd., 11 yd.
13 yd., 15 yd., 17 yd., lengths;

\$3, \$7, \$11, \$15, \$19, \$23, \$27, \$31, prices;

\$1, \$1 $\frac{2}{3}$, \$1 $\frac{4}{7}$, \$1 $\frac{2}{3}$, \$1 $\frac{8}{11}$, \$1 $\frac{10}{13}$, \$1 $\frac{1}{3}$, \$1 $\frac{1}{4}$, prices
per yard.

Ex. 24 600 —sum of series, 2 —ratio, and 320 —greatest extreme.

First, to find the No. of bushels of the first kind.
According to the rule under **685**, the sum of the series multiplied by the ratio less 1, is equal to the difference between the last term multiplied by the ratio and the first term; hence, $600 \times (2-1) = 600$, difference between the last term multiplied by the ratio, and the first term. Then, $320 \times 2 = 640$; and $640 - 600 = 40$ bu. of the first kind.

Next, to find the number of terms.
 $320 \div 40 = 8$; $8 \div 2 = 4$; $4 \div 2 = 2$; $2 \div 2 = 1$;
hence, $3+1=4$ kinds. *Ans.*

MISCELLANEOUS EXAMPLES.

(**701**, page 414.)

Ex. 1. $18 \times 2 = 36$; $36 \times 36 = 1296$ sq. ft. in both sides of the roof. But 1296 sq. ft. = 12.96 squares of 100 ft. each; and since 1000 shingles make 1 square (282, Note 3), there will be 12.96 M. shingles.

Ex. 2 $70 \text{ mi} \times \frac{2}{7} \times \frac{4}{7} \times \frac{1}{3} = 3.80952 + \text{mi.}$
 $1\ 875 \text{ mi.} \times .73 = 1.00375 \text{ mi.}$

2.80577 mi., Ans.

$$\$450 - \$335.40 = \$114.60, \text{ discount;}$$

$$\$158.75 - \$114.60 = \$39.15, \text{ Ans.}$$

Ex. 12. $\$6300 \times \frac{7}{9} = \$7200$, elder brother received.

$$\$6300 + \$7200 = \$13500, \text{ Ans.}$$

Ex. 13. $.7 = \frac{7}{10}$; $.88 = \frac{88}{100} = \frac{22}{25}$; $.727 = \frac{727}{1000}$;

$$.91325 = \frac{91325}{100000} = \frac{3653}{40000} = \frac{91325}{100000} = \frac{3653}{40000}.$$

Ex. 14. $\$438 \times \frac{112\frac{1}{2}}{90} = \$547.50, \text{ Ans.}$

Ex. 15. Int. on \$1 for 4 mo. 3 da. = \$.0239 $\frac{1}{8}$;

$$\$1 - \$.0239\frac{1}{8} = \$.9760\frac{7}{8}, \text{ proceeds of } \$1;$$

$$\$875.50 \div \$.9760\frac{7}{8} = \$896.95+, \text{ Ans.}$$

Ex. 16 $\$228.00 \div 5 = \$45.60$, A's monthly gain;

$$266.40 \div 8 = 33.30, \text{ B's "}$$

$$330.00 \div 12 = 27.50, \text{ C's "}$$

$$\underline{\$106.40}, \text{ entire "}$$

$$\$2128 \times \frac{45\frac{5}{8}}{1084} = \$912, \text{ A's stock;}$$

$$2128 \times \frac{33\frac{3}{4}}{1084} = 666, \text{ B's "}$$

$$2128 \times \frac{27\frac{5}{8}}{1084} = 550, \text{ C's "}$$

Ex. 17 $\$.35 \times 300 = \$105$, due Oct. 27;

$$.40 \times 150 = 60, \text{ " " 31;}$$

$$.38 \times 500 = 190, \text{ " Nov. 7;}$$

$$.42 \times 200 = 84, \text{ " " 12;}$$

$$.40 \times 250 = 100, \text{ " " 25;}$$

Hence, taking Oct. 27 for a focal date,

$$105 \times 0 = 000$$

$$60 \times 4 = 240$$

$$190 = 11 = 2090 \quad 6574 \div 539 = 12 \text{ da.};$$

$$84 \times 16 = 1344 \quad \text{Oct. 27} + 12 \text{ da.} = \text{Nov. 8, Ans}$$

$$100 \times 29 = 2900$$

$$\underline{539} \quad \underline{6574}$$

- Ex. 18. A, B, and C do $\frac{1}{12}$ of it in 1 day;
 C does $\frac{1}{24}$ of it, and A $\frac{1}{34}$; hence,
 B can do $\frac{1}{12} - (\frac{1}{24} + \frac{1}{34}) = \frac{5}{68}$ in 1 day; and
 $408 \div 5 = 81\frac{3}{5}$ days. *Ans.*
- Ex. 19. We here have an arithmetical series, of which 7 =
 the first term, 51 = last term, and 4 = com. diff.;
 by **679**, $\frac{51+7}{2} + 1 = 12$ da., time;
 and by **680**, $\frac{51+7}{2} \times 12 = 348$ mi., distance.
- Ex. 20. $\$2500 \times .0180\frac{2}{3} = \$45.21$ —, bank discount;
 $\$2500 \div 1.0175 = \$2457.00$ +, true present worth;
 $\$2500 - \$2457 = \$43$, true discount;
 $\$45.21 - \$43 = \$2.21$, *Ans.*
- Ex. 21. $\$5 \div 1.035 = \$4.830$ +, present worth of \$5;
 hence this is the better condition by $\$4.875$ —
 $\$4.83 = \$0.045$.
- Ex. 22. Since, if sold at cost, $\frac{1}{2}$ of the lot should have sold
 for only $\frac{1}{2}$ of the cost, the gain on $\frac{1}{2}$ was $\frac{5}{8} - \frac{1}{2} = \frac{1}{8}$
 of the cost; and $\frac{1}{8} \div \frac{1}{2} = 25$ %, *Ans.*
- Ex. 23. $\begin{cases} \$500 \\ 1 \text{ yr.} \end{cases} : \$50 = \begin{cases} \$960 \\ (?) \end{cases} : \$60$
 $(?) = \frac{\$960 \times \$60}{\$50} = \frac{5}{8} \text{ yr.} = 7 \text{ mo. } 15 \text{ da.}$, *Ans.*
- Ex. 24. The remainder, which is 88 % of the whole, must be
 sold for 125 % of the cost of the whole; hence 125
 $+ 88 = 1.42\frac{1}{2}$; $1.42\frac{1}{2} - 1 = 42\frac{1}{2}$ % above cost.
- Ex. 25. $\frac{165+20675}{2} = 182.53375$, greater;
 $\frac{165-20675}{2} = 182.46625$, less.
- Ex. 26. 7 yr. = 84 mo.; 3 yr. 10mo. 15 da. = $46\frac{1}{2}$ mo.,
 $\begin{cases} 445.625 \\ 84 \end{cases} : \begin{cases} 650 \\ 46\frac{1}{2} \end{cases} = 128.99 : (?)$
 $(?) = \frac{650 \times 445.625 \times 128.99}{84 \times 46\frac{1}{2}} = \$104.15$ +, *Ans.*

- Ex. 27. $\frac{540 \times 150 \times 7}{8} = \$10125$, invoice;
 $\$10125 \times 1.26 = \$12757.50$, sold for;
 $\$12757.50 \times .015 = \$191.36$, commission;
 $\$12757.50 - \$191.36 = \$12566.14$, net proceeds;
 $\$12566.14 \div .995 = \$12629.28 +$, Ans.
- Ex. 28. $\$.194 \times 5000 = \$970$, draft on Paris;
 $5000 \div 5.20 = \$961.53 +$, remittance from Paris.
- Ex. 29. $\$1000 \div .065 = \$15384.61 +$, stock required;
 $\$15384.61 \times 1.05 = \$16153.84$, Ans.
- Ex. 30. $\$25000 \times \frac{70}{100} = \$14583.33\frac{1}{3}$, stock at 8 %;
 $\$25000 \times .06 = 1500.00$, income of 6 % stock;
 $\$14583.33\frac{1}{3} \times .08 = 1166.66\frac{2}{3}$, " " 8 % "

 $\$333.33\frac{1}{3}$, Ans.
- Ex. 31. $\$15190 \div .28 = \$54250$, money of all.
 Suppose A has $\$1$,
 B will have $\frac{2}{3} \times \frac{4}{3} = \frac{8}{9}$,
 C " " $\frac{8}{9} \times \frac{2}{3} \times \frac{4}{3} = \frac{64}{27}$, } proportionate terms.
 Multiplying these proportioned terms by 81, we have
 81, 72 and 80, the proportional terms of A, B, and
 C respectively.
 $81 + 72 + 80 = 233$, sum of proportional terms;
 $\$54250 \times \frac{81}{233} = \$18859.44 +$, A's money;
 $\$54250 \times \frac{72}{233} = 16763.95 +$, B's "
 $\$54250 \times \frac{80}{233} = 18626.61 +$, C's "
- Ex. 32. $21 - 14 = 7$ payments, or deposits. Now the last de-
 posit will not draw interest; the last but one will
 draw compound interest for 2 half years, and the
 amount will be $\$250 \times 1.03^2$; the last but two will
 draw compound interest for 4 half years, and the
 amount will be $\$250 \times 1.03^4$; and so on. Hence,
 we have $\$250 =$ first term, $7 =$ No. terms, and 1.03^2

= the ratio, to find the sum of the series. Now
 $(1.03^2)^7 = 1.03^{14}$; hence by **686**,

$$\frac{(1.03^{14} - 1) \times 250}{1.03^2 - 1} = \$2104.227 +, \text{ Ans.}$$

Ex. 33 $\frac{1}{4} - \frac{2}{8} = \frac{7}{20}$ cents, profit on 1 peach;
 $420 \div \frac{7}{20} = 1200, \text{ Ans.}$

Ex. 34. Since he is to cover 7% of the cost for expenses and still clear $12\frac{1}{2}\%$ on the cost, the sales, without allowing for credit or bad debts, must be $100\% + 7\% + 12\frac{1}{2}\% = 119\frac{1}{2}\%$ of the cost. But, since the sales are on credit of 6 mo., the 119.5% is the present worth of the sales; and $119.5 \times 1.03 = 123.085\%$, the % of the cost, which the sales would be, without allowing for bad debts. Now, since 5% of the sales is lost by bad debts, the 123.085% of the cost is 95% of the sales. Hence
 $123.085 \div .95 = 129.56 + \%$, what the sales must be to cover all conditions; and
 $129.56 - 100 = 29.56 + \%, \text{ Ans.}$

Ex. 35 $28 \times 20 \times 10 = 5600$ days' work by 1st;
 $25 \times 15 \times 12 = 4500$ " " 2d;
 $18 \times 25 \times 11 = 4950$ " " 3d;
 $15 \times 24 \times 8 = 2880$ " " 4th;

 17930 " " all.
 $\$8600 \times \frac{5600}{17930} = \$2686.00 +, \text{ 1st receives,}$
 $\$8600 \times \frac{4500}{17930} = 2158.39 +, \text{ 2d "}$
 $\$8600 \times \frac{4950}{17930} = 2374.24 +, \text{ 3d "}$
 $\$8600 \times \frac{2880}{17930} = 1381.37 +, \text{ 4th "}$

Ex. 36. $75 \times \frac{599}{1000} \times \frac{64}{105} = 228\frac{1}{4}, \text{ Ans.}$

Ex. 37. $\$35.26 + \text{int. for 101 da.} = \$36.15$

$\$48.65 + \text{ " " 70 " } = 49.50$

$\$6.48 + \text{ " " 56 " } = 6.57$

$\$50.00 + \text{ " " 30 " } = 50.38$

$\$142.60, \text{ Ans.}$

Ex. 38. Had he received \$.35 per bushel less for the barley, the whole cost would have been $\$.35 \times 56 = \$19.60$ less, or $\$63.10 - \$19.60 = \$43.50$. But in this case, the prices of barley and corn would be equal. Hence $56 + 34 = 90$ bu., whole quantity;

$\$43.50 \div 90 = \$.48\frac{1}{3}$, price of corn;

$\$.48\frac{1}{3} + \$.35 = \$.83\frac{1}{3}$, " " barley.

Ex. 39. Since \$12950 is the proceeds of the note discounted for 6 mo., (allowing 3 days grace), $\$12950 + .96441666 = \$13427.81$, face of the note received for the flour, Dec. 1.

$\$13427.81 \div .85 = \$15797.42$, value, Nov. 1;

$\$15797.42 \div 1.30 = 12151.86$, " Oct. 1;

$\$12151.86 \div 1.25 = 9721.49$, paid for flour;

$\$12950 - \$9721.49 = \$3228.51, \text{ Ans.}$

Ex. 40. $\$660 \div 120 = \$5.50$, mean price;

$$5.50 \left\{ \begin{array}{l|l} 5.75 & \frac{1}{25} \\ 5.00 & \frac{1}{50} \end{array} \right. \left| \begin{array}{l|l} 2 & 80 \\ 1 & 40 \\ \hline 3 & 120 \end{array} \right. \text{ Ans. 80 bbl.}$$

Ex. 41. From the conditions of the question,

6 da. of 1st + 10 da. of 2d = \$38;

3 da. of 1st + 5 da. of 2d = \$19;

and 15 da. of 1st + 25 da. of 2d = \$95.

But 15 da. of 1st + 8 da. of 2d = \$61;

hence 17 da. of 2d = \$34;

and 1 da. of 2d = \$2.

Now, the 2d mechanic labored 8 da. + 10 da. = 18 da.

hence, $\$2 \times 18 = \$36$, 2d received ;

$\$61 + \$38 - \$36 = \$63$, 1st "

Ex. 42. $\$961.875 \div .15 = \$6412.50$, net value ;

$\$6412.50 \div \$1.25 = 51300$ lb., net weight ;

$180 \text{ lb.} \times .95 = 171 \text{ lb.}$, net weight of 1 box ;

$51300 \div 171 = 300$ bags, *Ans.*

Ex. 43. $\sqrt{4900} = 70$ lb., *Ans.*

Ex. 44. Had he worked 6 days in each week, he would have

received $60 \times \$2 = \$120$, and paid for board $10 \times$

$\$4 = \$40$, thus saving $\$120 - \$40 = \$80$; hence

$\$80 - \$72 = \$8$, deduction of wages for idle days ;

and $\$8 \div \$2 = 4$ da., idle ; $60 - 4 = 56$ da., he worked.

Ex. 45. $\$250 \times 1.806111 = \$451.528$, *Ans.*

Ex. 46. $\$120 \div 100 = \$1.20$, price per gal. of wine ;

$$1.00 \left\{ \begin{array}{c|c|c} 0 & \frac{1}{100} & 1 \\ 1.20 & \frac{1}{100} & 5 \end{array} \right\} \left| \begin{array}{c} 16\frac{2}{3} \\ 83\frac{1}{3} \\ \hline 6 \quad 100 \end{array} \right| \text{Ans. } 16\frac{2}{3} \text{ gal.}$$

Ex. 47. The quantity of water discharged by a pipe varies as the area of a section of the pipe, and consequently as the square of the diameter. Hence

$$\left\{ \begin{array}{l} 1 \\ 9 : 2 \end{array} \right\} \left\{ \begin{array}{l} 3 \\ 4 \\ (?) \end{array} \right\} = 1 : 3$$

$(?) = 2 \text{ h.} \times \frac{2}{3} \times \frac{3}{4} \times \frac{3}{2} = 4 \text{ h. } 30 \text{ min.}$, *Ans.*

Ex. 48. $\$4981.50 \div 1.025 = \$4860$ to be distributed ;

$\$4860 \div \$8100 = .60 = 60\%$, *Ans.*

Ex. 49. His asking price was 125% of the cost, and the selling price was $1.25 \times .86 = 1.075 = 107\frac{1}{2}\%$ of the cost ; hence,

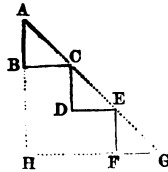
$$\begin{aligned} \$170 \div .075 &= \$2266.66\frac{2}{3}, \text{ cost;} \\ \$2266.66\frac{2}{3} + \$170 &= \$2436.66\frac{2}{3}, \text{ sold for;} \\ \$2266.66\frac{2}{3} \times 1.25 &= \$2833.33\frac{1}{3}, \text{ asking price.} \end{aligned}$$

Ex. 50. $231 \text{ cu. in.} \times 2000 = 462000 \text{ cu. in., solid contents;}$
 $\sqrt[3]{462000} = 77.3 + \text{in.} = 6 \text{ ft. } 5.3 \text{ in.} +, \text{Ans.}$

Ex. 51. $21 \text{ yr.} - 13 \text{ yr.} = 8 \text{ yr., 1st sum at interest;}$
 $21 \text{ yr.} - 15 \text{ yr.} = 6 \text{ yr., 2d " "}$
 $21 \text{ yr.} - 16\frac{1}{2} \text{ yr.} = 4\frac{1}{2} \text{ yr., 3d " "}$
 Now, $\$.06 \times 8 = \$.48$, int. of \$1 of the first sum
 $\$.06 \times 6 = .36$, " " " second "
 $\$.06 \times 4\frac{1}{2} = .27$, " " " third "
 And $\$.148 =$ present worth of \$1 of the first sum,
 $\$.138 =$ " " " " second "
 $\$.127 =$ " " " " third "

Hence, the \$5000 must be divided into parts proportional to $\frac{1}{148}$, $\frac{1}{138}$ and $\frac{1}{127}$; or, reducing to a common denominator, and using the numerators (418, III), the proportional terms are 17272, 18796, 20128. Then
 $17272 + 18796 + 20128 = 56196$
 $56196 : 17272 = \$5000 : (?) = \$1536.76 +, \text{ 1st;}$
 $56196 : 18796 = \$5000 : (?) = \$1672.36 +, \text{ 2d;}$
 $56196 : 20128 = \$5000 : (?) = \$1790.88 -, \text{ 3d.}$

Ex. 52. Let A B, B C, C D, D E, E F, and F G, represent the distances sailed on the successive days. A G will be the distance the ship departed from A, and A H + H G, or 2 A H, will be equal to the whole distance the ship sailed. Hence $A G^2 = 118.794^2 = 14112$, nearly; $14112 \div 2 = 7056 = A H^2$;
 $\sqrt{7056} = 84 = A H$; $84 \times 2 = 168 \text{ mi., Ans}$



Ex. 53. $4 P. \times 110 = 440$ gal. ;
 $\$2.15 \times 440 = \$946$, first cost ;
 $\$946 \times .24 = 227.04$, duty ;
 57.60 , freight ;

 $\$1230.64$, whole cost ;
 $\$1980 - \$1230.64 = \$749.36$, gain ;
 $\$749.36 \div \$1230.64 = 60.89 + \frac{1}{2}\%$, *Ans.*

Ex. 54. We form equations, as in Arbitration of Exchange the question being how many bushels of corn [(?) corn] are equal to 5 bbl. of flour.
 (?) bu. corn = 5 bbl. flour ;
 $17 \text{ bu. wheat} = 34.5 \text{ bu. corn}$;
 $59.5 \text{ bu. oats} = 9 \text{ bu. wheat}$;
 $42 \text{ lb. flour} = 6 \text{ bu. oats}$;
 $1 \text{ bbl. flour} = 196 \text{ lb. flour}$;

 $(?) = 42\frac{2}{3}\frac{8}{9}$, *Ans.*

Ex. 55. $100 - 8 \div 92\%$, price of the stock ; $92\% : (?) = 10\% : 7\%$ $(?) = \frac{22 \times 7}{10} = 64.4\%$; $100 - 64.4 = 35.6\%$ discount, *Ans.*

Ex. 56. $\pounds 400 \times \frac{1}{9} = \$1777\frac{7}{9}$, old par value ;
 $\$2000 - \$1777\frac{7}{9} = \$222\frac{2}{9}$, premium ;
 $\$222\frac{2}{9} \div \$1777\frac{7}{9} = 12\frac{1}{2}\%$, *Ans.*

Ex. 57. $21 \text{ mi.} - 7 \text{ mi.} = 14 \text{ mi.}$, B gains of A daily ;
 $84 \div 14 = 6$; hence A and B are together every 6 days. $7 \text{ mi.} + 14 \text{ mi.} = 21 \text{ mi.}$, A and C approach each other daily ; $14 \text{ mi.} + 21 \text{ mi.} = 35 \text{ mi.}$, B and C approach each other daily ; $84 \div 21 = 4$; that is, A and C meet every 4 days ;
 $84 \div 35 = 2\frac{2}{5} = 1\frac{2}{5}$; that is, B and C meet every $2\frac{2}{5}$ days ;
 Now, since A and B meet every 6th day, A and C

every 4th day, and B and C every $\frac{1}{8}$ day, the interval of time required for all to meet, is the least common multiple of 6 da., 4 da. and $\frac{1}{8}$ da. = 12 da.

Ex. 58.

10463	4	43200	$\frac{10463}{43200} = \frac{1}{4} + \frac{1}{7} + \frac{1}{11} + \frac{1}{37} + \frac{1}{165} + \dots$
		41852	
9436	7	1348	
1027	1	1027	
963	3	321	The approximating fractions are $\frac{1}{4}$, $\frac{7}{28}$, $\frac{8}{33}$, $\frac{31}{128}$, and $\frac{163}{673}$.
64	5	320	

Hence, there must be a leap year once in four years, 7 times in 28 years, 8 times in 33 years, 31 times in 128 years, or 163 times in 673 years.

Ex. 59. $\$14071 \div 10000 = \$1.4071$, the amount of \$1 for the time he owned the farm. By reference to the table of Compound Interest, we find that the time in which \$1 at 5% will amount to \$1.4071, is 7 years.

Now, 11 yr.—7 yr.=4 yr., the perpetuity in reversion when he purchased it.

$\$14071 \times .06 = \$844.26$, the perpetuity which his money would purchase, if it were to be entered upon immediately; and the equivalent perpetuity in reversion 4 years, is the amount of \$844.26 at 6% compound interest, for 4 years. Hence,

$$\$844.06 \times 1.26247 = \$1065.85, \text{ Ans.}$$

Ex. 60. $\$1 \div 1.035 = \$.966$, cash value of \$1;

$$\$1 - \$.966 = \$.034, \text{ gain on } \$.966;$$

$$$.034 \div \$.966 = .035+, \text{ Ans.}$$

Ex. 61. The several investments will form a geometrical series, of which the last will be the first term; the last but one multiplied by 1.05, the second term; and so on. Hence 1.05 = ratio, 50—21=29 = No. terms.

and \$30000 = the sum of the series, we are to find the first term.

Reversing the rule under **686**, we have

$$\frac{\$30000 \times (1.05 - 1)}{1.05^{20} - 1} = \frac{\$1500}{3.116136} = \$481.37, \text{ Ans.}$$

Ex. 62. The shares of the other two must be as 4 to 5; hence

$$4 + 5 = 9;$$

$$\$10000 \times \frac{4}{9} = \$4444\frac{4}{9}, \text{ share of 2d;}$$

$$\$10000 \times \frac{5}{9} = \$5555\frac{5}{9}, \text{ " " 3d.}$$

Ex. 63. (?) hhd. = 1500 bbl.;

$$50 \text{ bbl.} = 125 \text{ yd.};$$

$$80 \text{ yd.} = 6 \text{ bales};$$

$$13 \text{ bales} = 3\frac{1}{2} \text{ hhd.};$$

$$(?) = 75\frac{75}{104} \text{ hhd., Ans.}$$

Ex. 64. $12\frac{1}{4} - 5 = 6\frac{1}{4}$ mi., the 7th gains of the 1st, daily;

$$11\frac{1}{4} - 6\frac{1}{4} = 5 \text{ " " " " 2d "}$$

$$11\frac{1}{4} - 7\frac{1}{3} = 3\frac{11}{12} \text{ " " " " 3d "}$$

$$11\frac{1}{4} - 8\frac{1}{4} = 3 \text{ " " " " 4th "}$$

$$11\frac{1}{4} - 9\frac{1}{2} = 1\frac{3}{4} \text{ " " " " 5th "}$$

$$11\frac{1}{4} - 10\frac{1}{4} = 1 \text{ " " " " 6th "}$$

Hence, The 7th will pass the 1st once in $\frac{120}{6\frac{1}{4}}$ da.

						120
						$6\frac{1}{4}$
"	"	"	2d	"	"	$\frac{120}{6\frac{1}{4}}$ "
						120
"	"	"	3d	"	"	$\frac{120}{6\frac{1}{4}}$ "
						$3\frac{11}{12}$
"	"	"	4th	"	"	$\frac{120}{3\frac{11}{12}}$ "
						120
"	"	"	5th	"	"	$\frac{120}{3\frac{11}{12}}$ "
						$1\frac{3}{4}$
"	"	"	6th	"	"	$\frac{120}{1\frac{3}{4}}$ "

And the time required for the 7th to pass *all* the others at the same place, will be the least common multiple of the above intervals, which is found by dividing the least common multiple of the numerators by the greatest common divisor of the denominators. Least common multiple of $120=120$; Greatest common divisor of $6\frac{1}{4}$, 5, $3\frac{1}{2}$, 3, $1\frac{3}{4}$, and $1=\frac{1}{12}$; hence $120 \div \frac{1}{12}=1440$ da., *Ans.*

Ex. 65. 1 da.=86400 sec.

86400—20=86380, No. beats 1st makes in 1 da.;

86400+15=86415, “ “ 2d “ “ “

$\frac{86400}{86380}=\frac{4320}{4319}$ sec., time in which 1st makes 1 beat;

$\frac{86400}{86415}=\frac{5760}{5761}$ sec., “ “ “ 2d “ “ “

Now, the least common multiple of $\frac{4320}{4319}$ sec. and $\frac{5760}{5761}$ sec. is $\frac{17280}{7}$ sec., which is the interval of time that must elapse before the two pendulums will beat in unison. But in this time the 1st pendulum will make $\frac{17280}{7} \div \frac{4320}{4319}=2468$ beats; and the 2d pendulum will make $\frac{17280}{7} \div \frac{5760}{5761}=2469$ beats. Therefore, 2468 sec.=41 min. 8 sec. P. M., time by 1st; 2469 sec.=41 min. 9 sec. P. M., “ “ 2d.

Ex. 66. $(3^{30}-1) \times \frac{1}{3} \quad 3^{30}-1$
 $\frac{3-1}{6}=343,5188682441\frac{1}{3}$ in.;

$343,5188682441\frac{1}{3} \div 63360=541590730\frac{2}{3}\frac{2}{3}\frac{1}{2}$ mi.

Ex. 67. $105\% : 85\%=(?) : 6\%$ (?)= $\frac{105 \times 6}{85}=7\frac{7}{17}\%$

Ex. 68.

A. P.

$6 + 7 = \$.33$, 1st condition;

$10 + 8 = .44$, 2nd “

$1st \times 5 = 30 + 35 = \$1.65$

$2d \times 3 = 30 + 24 = 1.32$

$11 = \$.33$

$\$.33 \div 11 = 3$ cents, price of one peach;
 $\$.03 \times 7 = \$.21$; $\$.33 - \$.21 = \$.12$, price of 6 apples.
 $\$.12 \div 6 = 2$ cents, price of 1 apple.

Ex. 69

If A has \$9

B will have 5

and C will have $\frac{2}{7}$ of \$5 = $2\frac{1}{7}$ \$16 $\frac{1}{7}$

$2\frac{1}{7}$
 $\frac{2\frac{1}{7}}{16\frac{1}{7}} = \frac{1^6}{113}$, C's part of the whole estate,

 $\$3862.50 \div \frac{1^6}{113} = \$29097.50$, Ans.

Ex. 70

C. R.

 $16 + 20 = \$30$, 1st condition; $24 + 10 = 27$, 2d " $1st \times \frac{2}{3} = 24 + 30 = 45$ $20 = 18$

$\$18 + 20 = \$38$, price per bu. for rye,
 hence, from 1st or 2d, \$.75, " " corn.

Ex. 71 For 1 ox worth \$28,

there were 2 cows " 34

and 6 sheep " 45

\$107 $\$749 \times \frac{28}{107} = \$196$, sum paid for oxen $749 \times \frac{34}{107} = 238$, " cows; $749 \times \frac{45}{107} = 315$, " sheep;hence, $\$196 \div \$28 = 7$ oxen, $238 \div 17 = 14$ cows; $315 \div 7.50 = 42$ sheep.Ex. 72 $\$25000 \div .76 = \$32894.73 +$, Ans.

Ex. 73 The difference between the coat and \$20, and the
 coat and \$9, is $\$20 - \$9 = \$11$, which must be the

ratable wages for $20-12=8$ weeks. Hence

$\$11 \div 8 = \$1\frac{3}{8}$, one week's wages ;

$\$1\frac{3}{8} \times 20 = \$27.50$, wages for 20 weeks :

and $\$27.50 - \$20 = \$7.50$, value of coat.

Ex. 74. $540 \text{ A. } 36 \text{ P.} = 86436 \text{ sq. rd. ;}$
 $\sqrt{86436} = 294 \text{ rd., one side of square piece ;}$
 $86436 \div 42 = 2058 \text{ sq. rd., in each of equal square ;}$
 $\sqrt{2058} = 45.3 + \text{ rd., side of one of equal squares.}$

Ex. 75. $25 \text{ A.} = 4000 \text{ sq. rd. ; } \sqrt{4000} = 63.245 + \text{ rd., one}$
 side of the square field ; $63.245 \text{ rd.} \times 4 = 252.980$
 rd., perimeter of the square field. $4000 \div 2 = 2000 ;$
 $\sqrt{2000} = 44.721 \text{ rd., width of the rectangle ; } 44.721$
 rd. $\times 2 = 89.442 \text{ rd., length of the rectangle ; } (44.721$
 rd., $+ 89.442 \text{ rd.}) \times 2 = 268.326 \text{ rd., perimeter of}$
 the rectangle ; $268.326 \text{ rd.} - 252.980 \text{ rd.} = 15.346$
 rd., difference of the perimeters ;
 $\$.625 \times 15.346 = \$9.59 +$, *Ans.*

Ex. 76. The hour and minute hands start together at 12 o'clock ; at 1 o'clock the hour hand has passed over 1 twelfth of the dial, while the minute hand has passed over the whole dial. Therefore, the minute hand gains of the hour hand at the rate of $\frac{11}{12}$ of the dial in 60 min. But, at 5 o'clock the minute hand has $\frac{5}{12}$ of the dial to gain of the hour hand, before passing it. Hence
 $\frac{11}{12} : \frac{5}{12} = 60 \text{ min. : } (?) = 27 \text{ min. } 16\frac{4}{11} \text{ sec.}$
Ans. 27 min. $16\frac{4}{11}$ sec. past 5 o'clock.

Ex. 77. It is evident that, to increase the number in both rank and file by 1 man, would require twice the number in rank and file at first, plus 1 (for the man

at the corner). And, since to effect this requires
 $284 + 25 = 309$ men, $\frac{309-1}{2} = 154$ is the number of
 men in rank or file at first.

Hence $154^2 + 284 = 24000$, *Ans.*

Ex 78. 7 = first proportional term,

9 = second " "

$7 \times \frac{4}{3} = 9\frac{1}{3}$ = third

$25\frac{1}{3}$ = sum of " terms.

$25\frac{1}{3} : 7 = \$3648 : (?) = \$1008$

$25\frac{1}{3} : 9 = \$3648 : (?) = \$1296$

$25\frac{1}{3} : 9\frac{1}{3} = \$3648 : (?) = \$1344$

Ex 79. 6 A. 132 P. = 1092 P. Then

$13 \times 21 = 273$; $1092 \div 273 = 4$; $\sqrt{4} = 2$;

$13 \times 2 = 26$ rd., width; $21 \times 2 = 42$ rd. length;

$(26 \text{ rd.} + 42 \text{ rd.}) \times 2 = 136 \text{ rd. of fence.}$

Ex 80. A, B, C, and D, do $\frac{1}{13} = \frac{7989}{103740}$ of it in 1 day;

A, B, C, and E, " $\frac{1}{15} = \frac{6916}{103740}$ " "

A, B, D, and E, " $\frac{1}{12} = \frac{8645}{103740}$ " "

A, C, D, and E, " $\frac{1}{19} = \frac{5460}{103740}$ " "

B, C, D, and E, " $\frac{1}{14} = \frac{7440}{103740}$ " "

Taking the sum of the fractions, we shall have 4
 days' work of each man. Consequently

A, B, C, D, and E do $\frac{36411}{103740}$ of it in 4 days; and

A, B, C, D, and E " $\frac{36411}{414960}$ " 1 day.

Hence, $414960 \div 36411 = 11\frac{4813}{12137}$ da. required for
 all. If, now, from $\frac{36411}{414960}$, the part of the work
 which all could do in 1 day, we take, successively,
 the parts which B, C, D, and E; A, C, D, and E;
 A, B, D, and E; etc., can do in one day, we shall
 have the parts which A, B, C, D, and E can do,
 separately, in 1 day, thus :

$$\frac{36411}{414960} - \frac{7980}{103740} = \frac{4491}{414960}, \text{ E can do in one day ;}$$

$$\frac{36411}{414960} - \frac{6916}{103740} = \frac{8747}{414960}, \text{ D " "}$$

$$\frac{36411}{414960} - \frac{8646}{103740} = \frac{1831}{414960}, \text{ C " "}$$

$$\frac{36411}{414960} - \frac{5460}{103740} = \frac{14571}{414960}, \text{ B " "}$$

$$\frac{36411}{414960} - \frac{7410}{103740} = \frac{6771}{414960}, \text{ A " "}$$

$$\text{Therefore, } 414960 \div 4491 = 92\frac{1788}{4491} \text{ da. req. for E;}$$

$$414960 \div 8747 = 47\frac{3851}{8747} \text{ " D;}$$

$$414960 \div 1831 = 226\frac{1154}{1831} \text{ " C;}$$

$$414960 \div 14571 = 28\frac{6972}{14571} \text{ " B;}$$

$$414960 \div 6771 = 61\frac{929}{6771} \text{ " A;}$$

Hence B will do the work in the shortest time.

Ex. 81 The first has 1 share;

the second has $1 \times 1\frac{1}{2} = 1\frac{1}{2}$ "

the third has $1\frac{1}{2} \times 1\frac{1}{2} = 2\frac{1}{4}$ "

All have $4\frac{3}{4}$ "

$4\frac{3}{4} : 1 = \$500 : (?) = \$105\frac{5}{9}$, 1st has ;

$4\frac{3}{4} : 1\frac{1}{2} = \$500 : (?) = \$157\frac{17}{9}$, 2d "

$4\frac{3}{4} : 2\frac{1}{4} = \$500 : (?) = \$236\frac{16}{9}$, 3d "

Ex. 82 $\$2500 \times 5 = \$12500$ for 1 mo. ;

$\$5500 \times 7 = 38500$ " "

B's investments = $\$51000$ " "

$\$1333\frac{1}{3} \div 51000 = \$\frac{4}{153}$, B's (and also A's) gain per month on each \$1 of capital invested.

$\$5000 \times \frac{4}{153} \times 4 = \$522\frac{134}{153}$, A's gain during the first 4 months ;

$\$1066\frac{2}{3} - \$522\frac{134}{153} = \$543\frac{121}{153}$, A's gain during the last 8 months ;

$\$ \frac{4}{153} \times 8 = \$\frac{32}{153}$, gain on \$1 in 8 mo. ;

$\$543\frac{121}{153} \div \frac{32}{153} = \$2600$, A's capital for last 8 mo. ,

$\$5000 - \$2600 = \$2400$, Ans.

Ex. 83. There will be 4 intervals of time each $\frac{1}{2}$ year, and the rate 5 %; hence

$$\$12750 \div 1.215506 = \$10489.459-, \text{ Ans.}$$

Ex. 84. The proceeds of \$1 for 93 da. are \$.9819 $\frac{1}{8}$; and since he sells at 120 % of the purchase price, he realizes 120 % $\times$.9819 $\frac{1}{8}$ = 117.83 % in ready money. Subtracting 5 % + 2 % = 7 % for expenses, we have 117.83 % - 7 % = 110.83 %, his rate of net receipts on each investment. Hence

$$\begin{aligned} \$1500 & \times 1.1083 = \$1662.45, \text{ net proceeds 1st sale;} \\ \$1662.45 & \times 1.1083 = 1842.53+, \text{ " " 2d "} \\ \$1842.53 & \times 1.1083 = 2042.07+, \text{ " " 3d "} \\ \$2042.07 & \times 1.1083 = 2263.23+, \text{ " " 4th "} \\ \$2263.23 & - \$1500 = 763.23, \text{ whole gain, Ans.} \end{aligned}$$

Ex. 85. \$.80 $\times$ 1.20 = \$.96, what it must sell for; and since the selling price is 100 % - 10 % = 90 % of the asking price, we have \$.96 $\div$.90 = \$1.06 $\frac{2}{3}$, Ans.

Ex. 86. 25 $\times$ 20 = 500 yd.

$$\begin{aligned} \$4\frac{1}{3} & \times 500 = \$2187.50, \text{ purchase price;} \\ \$4\frac{1}{3} & \times 500 = 2312.50, \text{ selling "} \\ \$2312.50 & \div 1.02 = \$2267.15, \text{ cash value of sale;} \\ \$2187.50 & + 1.045 = 2093.30, \text{ " purchase.} \\ & \underline{\hspace{1.5cm}} \\ & \$173.85, \text{ Ans.} \end{aligned}$$

Ex. 87. \$1200 $\div$ 200 = 6, number of payments;

$$\frac{(1.08^6 - 1) \times 200}{.08} = \$1437.185, \text{ amount of the annuity}$$

at the maturity of the last installment. And since this sum will be at compound interest for 10 - 6 = 4 years.
\$1467.185 $\times$ 1.360489 = \$1996.07 +, Ans.

Ex. 88. The amount of an annuity of \$3000 in arrears for

$$10 \text{ years, is } \frac{(1.06^{10} - 1) \times \$3000}{.06} = \$39542.40.$$

The present worth of this sum, due 10 years hence, is $\$39542.40 \div 1.790848 = \$22080.28$, the value of the bequest to the eldest son.

The present value of the same sum due 20 years hence is $\$39542.40 \div 3.207136 = \$12329.51$, the value of the bequest to the second son.

The worth of the perpetuity when entered upon by the institution, was $\$3000 \div .06 = \$50000$.

But, as the perpetuity is not to be entered upon til 20 years after the man's decease, its present value is $\$50000 \div 3.207136 = \$15590.23$.

Ex. 89. It requires $5+1=6$ days for the horse team to perform the trip and rest a day, $7+1=8$ days for the mule team, and $11+1=12$ days for the ox team to do the same. Now, the least common multiple of 6 da., 8 da. and 12 da is 24 da. Therefore the three teams will rest together on the 24th day, and consequently $24-1=23$ da. must elapse before this day comes.

Ex. 90. The interest on an obligation payable in annual installments (U. S. Rule) is equivalent to Comp. Int. ; hence, find what principal a *one-dollar* annual payment will pay in 3 years, by dividing the amount of 3 annual payments of \$1 each, by the amount of \$1 for 3 yr., both at Comp. Int.

The amount of \$1 for 4 yr. at Comp. Int. is \$1.262477.

The amt. of \$1 for 3 yr. at 6% Comp. Int. is \$1.191016					
"	"	2	"	"	1.123600
"	"	1	"	"	1.060000
"	"	0	"	"	1.000000
					<u>\$4.374616</u>

$\$4.374616 \div 1.262477 = \$3.465105$, which is the principal that \$1 annual payments will cancel in 4 yr. at 6% Comp. Int., U. S. Rule. Hence, $\$4500 \div 3.465105 = \$1298.66 +$, *Ans.*

Or, divide the amount of \$4500 for 4 yr. at 6% Comp. Int., which is \$5681 1455 by 4.374616 = \$1298.66 +, *Ans.*

Ex. 91. Of the payments coming due after Jan. 1, 1864, one is to be discounted for 2 half years at 6% per annum, or for 2 intervals at 3%; and the other for 4 intervals at 3%. Hence,

$$\begin{aligned}
 & \$1050, \quad 4\text{th payment;} \\
 & \$1050 \div 1.0609 = \$989.725 +, \text{ present val. 5th pay't.} \\
 & \$1050 \div 1.125500 = \underline{932.911 +}, \quad \text{"} \quad 6\text{th} \quad \text{"} \\
 & \quad \quad \quad \$2972.636 +, \text{ } Ans.
 \end{aligned}$$

Ex. 92. $2 \times 3 = 6$; $864 \div 6 = 144$; $\sqrt{144} = 12$;
 $3 \times 12 = 36$, No. of rows;
 $2 \times 12 = 24$, " trees in each row.

And since the spaces between the trees are 1 less, each way, than the number of trees,

(428)

$(36-1) \times 7 = 245$ yd., length of the orchard ;

$(24-1) \times 7 = 161$ yd., breadth " "

$245 \times 161 = 39445$ sq. yd., *Ans.*

Ex. 93 $\$2500 \times 1.06 = \$2650$, first cost ;

$\$2650 \times 1.225043 = \$3246.36$, amount for 3 yr.;

$\$3246.36 \times 1.0175 = 3303.17$, " 3 yr. 3 mo,

which is to be considered as the whole cost of the investment.

Now, there were received 6 dividends of \$100 each, received 2 yr. 9 mo., 2 yr. 3 mo., 1 yr. 9 mo., 1 yr. 3 mo., 9 mo., and 3 mo., respectively, before the sale of the stock. Hence, reckoning compound interest,

Amt. of \$100 for 2 yr. 9 mo. = \$120.50

" " 2 " 3 " = 116.49

" " 1 " 9 " = 112.62

" " 1 " 3 " = 108.87

" " 9 " = 105.25

" " 3 " = 101.75

Value of dividends, \$ 665.48

Sale of stock, $\$2500 \times 1.11 = 2775.00$

Whole sum realized, \$3440.48

$\$3440.48 - \$3303.17 = \$137.31$, *Ans.*

MENSURATION.

(729, page 423.)

2. $30 \times 40 \div 2 = 600$; area, 600 sq. ft., *Ans.*
3. $12.5 \times 6.75 \div 2 = 42.1875$; $42\frac{3}{8}$ sq. ft., *Ans.*
4. $25.01 \times 18.14 \div 2 = 226.84$; 22 A. 6 ch. 13.45 P., *Ans.*
5. $\$60 \times (15.48 \times 9.67 \div 2 \div 10) = \$449.07$.
6. $\$.40 \times 35 \times 21 \div 2 = \$147$, *Ans.*
7. $28 \times 15 \div 2 = 210$; 210 sq. ft., *Ans.*

(730, page 424.)

2. $20\frac{1}{4} \times 2 \div 9 = 4.5$; $4\frac{1}{2}$ ft., *Ans.*
3. $65 \times 2 \div 10 = 13$; 13 in., *Ans.*
4. $588 \times 2 \div 42 = 28$; 28rd., *Ans.*
5. $30\frac{1}{4} \times 160 \times 6\frac{1}{4} \times 2 \div 17 = 3701\frac{3}{4}$; 3701 $\frac{3}{4}$ yd. = 672 rd. $5\frac{3}{4}$ yd., *Ans.*
6. 5 A. 33 P. = 833 P.; 12.25 ch. = 49 rd.
 $833 \times 2 \div 49 = 34$; 34 rd. = $8\frac{1}{2}$ ch., *Ans.*
7. $\$1050 \div \$5.25 = 200$; $200 \times 2 \div 8 = 50$; 50 rd., *Ans.*

(731, page 424.)

2. $\frac{20 + 15 + 15}{2} = 25$; $25 - 20 = 5$; $25 - 15 = 10$.
 $\sqrt{25 \times 5 \times 10 \times 10} = 111.85$; 111.85 sq. ft., *Ans.*
3. Half sum = 105; $105 - 70 = 35$.
 $\sqrt{105 \times 35 \times 35 \div 160} = 13.26$; 13.26 A.; 13 A. 41.76 P., *Ans.*
4. Half sum = 34; $34 - 30 = 4$; $34 - 20 = 14$; $34 - 18 = 16$.
 $\sqrt{34 \times 4 \times 14 \times 16 \times 2} = 349.07$; 349.07 sq. ft., *Ans.*

(733, page 425.)

2. $\sqrt{36^2 + 15^2} = 39$; 39 ft., *Ans.*
3. $\sqrt{20^2 + 16^2} = 25.6$; 25 ft. 7 in. +, *Ans.*
4. $\sqrt{25^2 + 23^2} = 33.97$; 33.97 ch. +, *Ans.*
5. $\sqrt{20^2 + 16^2 + 12^2} = 28.28$; 28.28 ft., 28 ft. 3.36 in.,
Ans.
 $\sqrt{20^2 + 16^2}$ = distance from corner to corner on the floor. This is now taken as the base of a new triangle, whose altitude is 12.

(734, page 426.)

2. $\sqrt{53^2 - 28^2} = 45$; 45 yd., *Ans.*
3. $\sqrt{380^2 - 120^2} = 360.5$; 360 ft. 6 in. +, *Ans.*
4. $\sqrt{52^2 - 48^2} = 20$; 20 ft., *Ans.*

(745, page 427.)

2. $10.5 \times 8 = 84$; 84 sq. ft., *Ans.*
3. $8.75 \times 6 \div 10 = 5\frac{1}{4}$; $5\frac{1}{4}$ A., *Ans.*

(746, page 427.)

2. $\overline{178 + 146} \div 2 \times 69 = 11178$; 11178 sq. ft., ~~*Ans.*~~
3. $\overline{18 + 25} \div 2 \times 16 \div 12 = 28\frac{2}{3}$; $28\frac{2}{3}$ sq. ft., *Ans.*
4. $\overline{38 + 26} \div 2 \times 10 \div 160 = 2$; 2 A., *Ans.*

(747, page 428.)

2. $\overline{9 + 12.5} \div 2 \times 35.5 = 381.625$; $381\frac{5}{8}$ sq. ft., *Ans.*
3. $(20.453 + 50.832) \div 2 \times 80 \div 160 = 17.82125$; 17 A
131.4 P., *Ans.*

(751, page 429.)

2. $5.5 \text{ ft.} \times 3.1416 = 17.2788 \text{ ft.} = 17 \text{ ft. } 3 \text{ in., } \textit{Ans.}$
4. $50 \text{ ft.} \div 3.1416 = 15.9 + \text{ft.} = 15 \text{ ft. } 10.98 \text{ in., } \textit{Ans.}$
5. $18.5 \text{ ft.} \div 3.1416 = 5.88 + \text{ft.} = 5 \text{ ft. } 10.6 \text{ in., } \textit{Ans.}$
6. $7.75 \text{ ft.} \times 3.1416 = 24.3474 \text{ ft.} = 24 \text{ ft. } 4 \text{ in., } \textit{Ans.}$
7. $8.5 \text{ ft.} \times 3.1416 = 26.7 + \text{ft.} = 26 \text{ ft. } 8 \text{ in., } \textit{Ans.}$
8. $31.416 \text{ ft.} \div 3.1416 \div 2 = 5 \text{ ft., } \textit{Ans.}$
9. $10 \text{ ft.} \times 2 \times 3.1416 = 62.832 \text{ ft., } \textit{Ans.}$
10. $14 \text{ in.} \times 2 \times 3.1416 = 87.96 \text{ in.} = 7 \text{ ft. } 3.96 \text{ in., } \textit{Ans.}$

(752, page 429.)

4. $200 \text{ ch.} \times \left(\frac{200 \div 3.1416 \div 4}{4} \right) \div 10 = 318.3; 318.3 \text{ A., } \textit{Ans.}$
5. $480 \text{ rd.} \times \left(\frac{480 \div 3.1416 \div 4}{4} \right) \div 160 = 114.59 \text{ A., } \textit{Ans.}$
6. $20 \times 2^2 \times .7854 = 1256.64; 1256.64 \text{ sq. in.; } 8 \text{ sq. ft. } 104.64 \text{ sq. in., } \textit{Ans.}$

(753, page 430.)

3. $\sqrt{38.4846 \div .7854} = 7; 7 \text{ rd., } \textit{Ans.}$
4. $\sqrt{286.488 \div .7854} = 19.09, \text{ diameter.}$
 $19.09 \text{ ft.} \times 3.1416 = 59.97 \text{ ft., circumference.}$

(754, page 430.)

2. $\sqrt{200^2 \div 2} = 141.42; 141.42 \text{ ft., } \textit{Ans.}$
3. $104 \div 3.1416 \times .7071 = 23.4 +; 23.4 \text{ yd., } \textit{Ans.}$

(755, page. 431.)

2. $\frac{7.75 + 4.25}{2} \times \frac{7.75 - 4.25}{2} \times .7854 = 32.98; 32.98 \text{ sq. ft., } \textit{Ans.}$

3. $(35.75 + 16.25) \times (35.75 - 16.25) \times .7854 = 796.39$;
796.39 sq. ft., *Ans.*
4. 1 A. 154.16 P. = 314.16 P.; $\sqrt{314.16 \div .7854} = 20$,
diameter.
- $\frac{20 + 10}{2} \times 20 - 10 \times .7854 = 235.62$ P., area of L. }
314.16 sq. rd. - 235.62 sq. rd. = 78.54 P., area of W. } *A.*

(756, page 431.)

2. $\sqrt{36 \times 81} = 54$, *Ans.*
3. $\sqrt{42 \times 168} = 84$, *Ans.*
4. $\sqrt{64 \times 12.25} = 28$, *Ans.*
5. $\sqrt{8 \times 288} = 48$, *Ans.*
6. $\sqrt{\frac{3}{4} \times \frac{4}{3}} = \frac{1}{2} = \frac{1}{2}$, *Ans.*
7. $\sqrt{\frac{2}{3} \times \frac{1}{2}} = \frac{1}{\sqrt{3}}$, *Ans.*
8. $\sqrt{36 \times 30} = 32.86$; 32.86 lb., *Ans.*

(757, page 432.)

5. $3 : 45387 :: 3^2 : x^2$; $x = 369$ rd. long, *Ans.*
 $3 : 45387 :: 1^2 : x^2$; $x = 123$ rd. wide, *Ans.*
6. $55.1 : 300 :: 1.5^2 : x^2$; $x = 3.5$ in., *Ans.*
7. The area of a triangle whose sides are 13, 14, and 15
ft. is 84 sq. ft.
- $84 : 24276 :: 13^2 : x^2$; $x = 221$ ft. }
 $84 : 24276 :: 14^2 : x^2$; $x = 238$ ft. } *Ans.*
 $84 : 24276 :: 15^2 : x^2$; $x = 255$ ft. }
8. $240^2 : 1^2 :: 37635840 \text{ in.} : x \text{ in.}$; $x = 653.4$, *Ans.*
9. The cost to inclose depends upon the circumference.
We then consider the cost as a representative of the
circumference.
- $1 : \frac{1}{2} :: 167.7^2 : x^2$; $1 = \$75$, *Ans.*
10. $80 : 1200 :: 6^2 : x^2$; $x = 23.2$ ft., *Ans.*
11. 2 A. : 8 A. : 63.39^2 rd. : x^2 rd.; $x = 126.78$ rd., *Ans.*

(758, page 433.)

1. $270 \times 3 \times 2 \div 45 = 36$; 36 ft., *Ans.*
2. $(48 + 48 + 28 + 28) \div 4 = 38$; $38^2 = 1444$; 1444 sq. ft.,
Ans.
3. $3 : 1323 :: 1^2 : x^2$; $x = 21$.
 $3 : 1323 :: 3^2 : x^2$; $x = 63$; 21 rd. by 63 rd., *Ans.*
4. $\sqrt{36^2 - 18^2} \times 18 = 561$; 561 sq. ft., *Ans.*
5. $\sqrt{7569} = 87$; 87 ft., *Ans.*
6. 20 A. = 3200 sq. rd.; $\sqrt{3200 \times 4} = 226.274 +$, perimeter
of square; $\$2.40 \times 226.274 = \$543.16$, cost.
 $\frac{1}{8} : 3200 :: 1^2 : x^2$; $x = 126.491$ = length in rods.
 $\frac{1}{8} : 3200 :: (\frac{1}{8})^2 : x^2$; $x = 25.298$, width in rods.
 $126.491 + 126.491 + 25.298 + 25.298 = 303.578$, peri-
meter of rectangle.
 $\$2.40 \times 303.6 = \$728.59$, cost for rectangle.
 $\$728.59 - \$543.16 = \$185.43$, *Ans.*
7. $\sqrt{25^2 + 20^2 + 15^2} = 35.35$ ft., *Ans.*
8. $\sqrt{20^2 + 15^2} = 25$; 25 ft., *Ans.*
9. $\sqrt{25^2 + 15^2} = 29.15 +$; 29.15 ft., *Ans.*
10. $1\frac{1}{4}$ sq. m. = 128000 sq. rds.
 $\sqrt{128000 \div .7854} = 403.7$; 403.7 rd., *Ans.*
11. 5 A. = 800 sq. rd.; $\sqrt{800 \times 4} = 113.12$, No. of rods in
perimeter of square.
 $\sqrt{800 \div .7854} \times 3.1416 = 100.25$, No. of rd. in circum.
 113.12 rd. - 100.25 rd. = 12.87 rd., *Ans.*
12. $\$75 \times (40 + 22 \div 2 \times 25) \div 10 = \$5812.50$, *Ans.*
13. $20^2 - (20^2 \times .7854) = 85.84$; 85.54 sq. ft., *Ans.*

14. The altitude of this rhombus is that of a right-angled triangle whose hypotenuse is 15 ft. and base 9 ft. or 12 ft.; $\$.18 \times \overline{15 \times 12} = \$32.40$, *Ans.*
15. $\sqrt{50^2 - 4^2} = 49.839 = \text{radius}$; diameter = 99.678 ft.
 $99.678 \text{ ft.} \times 3.1416 = 313.14 \text{ ft.} = \text{circumference.}$
 $99.678 \times 313.14 \div 4 = 7803.79$; $7803.79 \text{ sq. ft.} = 28.66 \text{ P., area.}$
16. $40^2 - (\sqrt{40^2 \div 2})^2 = 800$; $800 \text{ sq. rd.} = 5 \text{ A., } Ans.$
17. Half sum of sides = 71; $71 - 40 = 31$; $71 - 48 = 23$;
 $71 - 54 = 17$; $\sqrt{71 \times 31 \times 23 \times 17} = 927.68$.
 $\$.125 \times \overline{927.68 \div 160} = \$724.75$, *Ans.*
18. $1 : 4 :: 10^2 : x^2$; $x = 20$; 20 ft., *Ans.*
19. $36^2 \times .7854 - (\sqrt{36^2 \div 2})^2 = 369.8784$; $369.8784 \text{ sq. ft., } Ans.$
20. $200^2 \times .7854 \div 2 = 15708$; $15708 \text{ sq. rd.} = 98 \text{ A. } 28 \text{ rd., } Ans.$
21. $2 : 1 :: 100^2 : x^2$; $x = 70.71$, side of garden inside the walk in rods.
 $100 \text{ rd.} - 70.71 \text{ rd.} \div 2 = 14.645 \text{ rd., } Ans.$
22. $540 \text{ A. } 36 \text{ P.} = 86436 \text{ sq. rd.}$; $\sqrt{86436} = 294$; 294 rd.
 $\sqrt{86436 \div 42} = 45.36 \text{ rd., } Ans.$
23. $15 \text{ A.} = 2400 \text{ P.}$; $2400 \div 30 = 80$; 80 rd., length.
 $80 \text{ rd.} = 1320 \text{ ft.}$; $\sqrt{1320^2 - 120^2} = 1314.5 \text{ ft.}$;
 $1314.5 \text{ ft.} = 79.68 \text{ rd.}$; $79.68 \times 30 \div 160 = 14.9 \text{ A., } Ans.$
24. $12 : 48 :: 3^2 : x^2$; $x = 6$; 6 in., *Ans.*

(765, page 436.)

4. $6 \times 3.1416 \times 8 + (6^2 \times .7854 \times 2) = 207.3456$; $207.34 \text{ sq. ft., } Ans.$

$$5. (4\frac{1}{2} + 4\frac{1}{2} + 3\frac{1}{2} + 3\frac{1}{2}) \times 8\frac{1}{2} + (4\frac{1}{2} \times 3\frac{1}{2} \times 2) = 168\frac{1}{2}; 168\frac{1}{2} \text{ sq. ft., } \textit{Ans.}$$

$$6. (4 \times 2 \times 3.1416 \times .65) + (\overline{4 \times 2^2} \times .7854 \times 2) = 263.8944; 263.89 + \text{sq. ft., } \textit{Ans.}$$

$$7. 15 \times 18 + (\frac{1}{2}\sqrt{6^2 - 3^2} \times 6 \times 2) = 301.176; 301.176 \text{ sq. ft., } \textit{Ans.}$$

(766, page 437.)

$$3. 9.8 \times 7.5 \times 5.25 = 385.875; 385.875 \text{ cu. ft., } \textit{Ans.}$$

$$4. \overline{1.5^2} \times .7854 \times 18 = 31.8 +; 31.8 \text{ cu. ft., } \textit{Ans.}$$

$$5. 6.5 \times 6.5 \times 6.5 = 274.625; 274\frac{1}{2} \text{ cu. ft., } \textit{Ans.}$$

$$6. \$30 \times 1.5 \times 1.5 \times 40 = \$27, \textit{Ans.}$$

$$7. \overline{2.5^2} \times .7854 \times 15 = 73.63 +, \textit{Ans.}$$

(775, page 438.)

$$3. 8.5 \times 4 \times 10.5 + \overline{8.5 \times 8.5} = 429.25; 429.25 \text{ sq. ft., } \textit{Ans.}$$

$$4. 6.75 \times 3.1416 \times 22.5 + (\overline{6.75^2} \times .7854) = 512.9 +; 512.9 \text{ sq. ft., } \textit{Ans.}$$

$$5. \$25 \times (5 \times 6 \times 30 \div 9) = \$25, \textit{Ans.}$$

(776, page 439.)

$$3. \overline{2.5^2} \times .7854 \times 8 = 39.27; 39.27 \text{ cu. ft., } \textit{Ans.}$$

$$4. \text{Area of base} = 3.899 \text{ sq. ft.} \\ \$2.50 \times 3.897 \times 9 \div 3 = \$29.23, \textit{Ans.}$$

$$5. \sqrt{130^2 - (40^2 + 30^2)} = 120, \text{altitude of pyramid.}$$

$$\sqrt{120^2 + 40^2} = 126.49, \text{slant height of end.}$$

$$\sqrt{120^2 + 30^2} = 123.69, \text{ " " " side.}$$

$$80 \times 60 \times 120 \div 3 = 192000; 192000 \text{ cu. ft. vol., } \textit{Ans.}$$

$$\begin{array}{rcl} \overline{60+60} \times 126.49 \div 2 & = & 7589.4, \text{ surface of ends.} \\ \overline{80+80} \times 123.69 \div 2 & = & 9895.2, \quad \text{“} \quad \text{“} \quad \text{sides.} \\ 80 \times 60 & = & 4800. \quad \text{“} \quad \text{“} \quad \text{base.} \\ & & 22284.6; 22284.6 \text{ sq. ft. surface} \\ & & \text{Ans.} \end{array}$$

(777, page 439.)

2. $\overline{30+16} \times 7.5 = 345$; 345 sq. ft., *Ans.*
 3. $(\overline{8 \times 7} + \overline{4 \times 7}) \times 27.5 \div 9 = 256\frac{2}{3}$; $256\frac{2}{3}$ sq. yd., *Ans.*

(778, page 440.)

2. $[(4^2 \times .7854) + (3^2 \times .7854) + \sqrt{(4^2 \times .7854) \times (3^2 \times .7854)}] \times 2 = 58.1196$; 58.1196 cu. ft., *Ans.*
 3. $(\overline{1.25 \times 1.25} + \overline{1 \times 1} + \sqrt{1.25^2 \times 1^2}) \times 10 = 38.125$; 38.125 cu. ft., *Ans.*
 4. $5 \text{ ft.} \div 3.1416 = 1.5917 \text{ ft.}$, diameter of lower base.
 $3 \text{ ft.} \div 3.1416 = .95502 \text{ ft.}$, “ “ upper base.
 $1.5912 \times 5 \div 4 = 1.989625$, area of lower base in sq. ft.
 $.9549 \times 3 \div 4 = .716265$, “ “ upper “ “ “
 $\sqrt{1.989625 \times .716265} = 1.1935$.
 $(1.989625 + .716265 + 1.1935) \times 50 \div 3 = 64.9898$;
 64.9898 cu. ft., *Ans.*

(779, page 440.)

2. $16 \times 3.1416 \times 16 = 804.25$; 804.25 sq. in., *Ans.*
 3. $31.416 \text{ ft.} \div 3.1416 = 10 \text{ ft.}$ = diameter.
 $31.416 \times 10 = 314.16$; 314.16 sq. ft., *Ans.*
 4. $2 \text{ ft.} \times 3.1416 = 6.2832 \text{ ft.}$ = circumference.
 $6.2832 \times 2 = 12.5664$; 12.5664 sq. ft., *Ans.*

(780, page 440.)

2. $30 \times 30 \times 3.1416 \times \overline{30 \div 6} = 14137.2$; 14137.2 cu. in.,
Ans.
3. $10 \times 10 \times 3.1416 \times 10 \div 6 = 523.6$; 523.6 cu. yds., *Ans.*
4. $31.416 \text{ ft.} \div 3.1416 = 10 \text{ ft., diameter.}$
 $10 \times 31.416 \times 10 \div 6 = 523.6$; 523.6 cu. ft., *Ans.*

(781, page 441.)

2. $\sqrt[3]{3000 \div (2 \times 3 \times 4)} = 5$; 2, 3, and 4 times 5 ft. or
10 ft., 15 ft., and 20 ft., *Ans.*
3. $\sqrt[3]{30720 \div (3 \times 4 \times 5)} = 8$; 3, 4, and 5 times 8 ft. or
24 ft., 32 ft., and 40 ft., *Ans.*
4. $\sqrt[3]{405 \div (2 \times 2\frac{1}{2} \times 3)} = 3$; 6, $7\frac{1}{2}$, and 9, *Ans.*

(783, page 442.)

1. $\sqrt{1050 \div 6} = 13.2287$ +, edge in ft.
 $\overline{13.2287^3} = 2315.03$, volume in cu. ft.
2. $\sqrt[3]{2150.42 \times 1250} = 139$; 139 in. = 11 ft. 7 in., *Ans.*
3. $4^3 : 12^3 :: 1 : x$; $x = 27$, *Ans.*
4. $(\overline{7^2 \times .7854} + \overline{5^2 \times .7854} + \sqrt{(7^2 \times .7854) + (5^2 \times .7854)})$
 $\times \overline{7 \div 3} = 199.7534$ = volume in cu. ft.
 $1728 \text{ cu. in.} \times 199.7534 \div 231 \text{ cu. in.} = 1494.25$, No. of
gal., *Ans.*
5. $(1.25^2 + .5^2 + \sqrt{1.25^2 \times .5^2}) \times 8 = 19.5$, No. cu. ft.
 $\$.28 \times 19.5 = \$5.46$, *Ans.*

6. $1728 \div (\frac{1}{2} \times \frac{1}{2} \times 1) = 6912$, length in inches, = 576 ft.,
Ans.
7. $8.3^2 \times .7854 \times 7 \times 1728 \div 231 \div 31\frac{1}{2} = 89.9$, No. of bbl.,
Ans.
8. $(\sqrt{3^2 \div 2})^2 \times 18 = 81$, No. of cu. ft., *Ans.*
9. 7 sq. ft. 6 sq. in. = 1014 sq. in.; $\sqrt{1014 \div 6} = 13$, side of cube.
 $13^3 = 2197$; 2197 cu. in. = 1 cu. ft. 469 cu. in., *Ans.*
10. 27 cu. ft. : 81 cu. ft. :: $10^3 : x^3$; $x = 14.42$, No. of inches, *Ans.*
11. $7912 \times 7912 \times 3.1416 \times 7912 \div 6 = 259333411782.8608$, volume in cu. mi., *Ans.*
12. There will be 12 times as many board ft. as cubic ft.
 $((\frac{1}{4})^2 + (\frac{1}{3})^2 + \sqrt{(\frac{1}{4})^2 \times (\frac{1}{3})^2}) \times 11 \div 3 \times 12 = 40\frac{2}{3}$;
40 ft. $7\frac{2}{3}$ in., *Ans.*
13. $12^2 \times 6 = 864$ = surface of cube = surface of sphere.
 $12^3 = 1728$ cu. in. = 1 cu. ft., volume of cube.
 $\sqrt{864 \div 3.1416} = 16.58$, diameter of sphere.
 $864 \times 16.58 \div 6 = 2387.52$ cu. in. = 1 cu. ft. 659.5 cu. in., volume of sphere, *Ans.*
14. $\sqrt[3]{4913} = 17$; $17^2 \times 6 = 1734$, surface in sq. ft., *Ans.*
15. $\sqrt[3]{2150.42 \times 450 \div 3} = 68.5$; 68.5 in. $\times 3 = 205.5$ in. = 17 ft.
1.5 in., length; 68.5 in. = 5 ft. 8.5 in., width and depth,
Ans.
16. $4.5^3 : 9^3 :: 18 \text{ oz.} : x$; $x = 144$ oz., *Ans.*

$$17. 10 \times 10 \times \overline{3.1416} \times 10 \div 6 \div 2 \times 1728 \div 231 \div 6 = 326.4; 326.4 \text{ min.} = 5 \text{ hr. } 26 \text{ min. } 24 \text{ sec., } \textit{Ans.}$$

$$18. 640 : 270 :: 8^3 : x^3; x = 6, \text{ No. of feet, } \textit{Ans.}$$

$$19. 8^3 : 24^3 :: 8 \text{ cwt.} : x; x = 216 \text{ cwt., } \textit{Ans.}$$

$$20. 75 \text{ hhd.} = 4725 \text{ gal.} = 1091475 \text{ cu. in.} = 631.64 \text{ cu. ft.,}$$

contents of cistern.

$$8^3 \times .7854 \times 1 = 50.2656, \text{ No. of cu. ft. in cistern 1 ft. deep.}$$

$$631.64 \text{ cu. ft.} \div 50.2656 \text{ cu. ft.} = 12.56 +, \text{ No. of ft. in depth.}$$

$$21. 3^3 : x^3 = 2500 : 4960.$$

$$x^3 = \frac{4960 \times 9}{2500} : x = \frac{3\sqrt{4960}}{50} = 4.225 +, \text{ No. in., } \textit{Ans.}$$

$$22. 8^3 \times .7854 \times 4 \div 3 \times 1728 \div 2150.42 = 53.855, \text{ No. of bu., } \textit{Ans.}$$

(786, page 443.)

$$2. 21 + (\overline{30 - 21} \times \frac{2}{3}) = 27; 27^2 \times 40 \times .0034 = 99.144, \text{ No. gal., } \textit{Ans.}$$

$$3. 26 + (\overline{31 - 26} \times .6) = 29; 29^2 \times 42 \times .0034 = 120.0948, \text{ No. gal., } \textit{Ans.}$$

(789, page 445.)

$$1. \$42.75 \times (189.5 \text{ rd.} \times 150) \div 160 = \$7594.80, \textit{Ans.}$$

$$2. 70 \text{ rd.} \times 70 = 4900 \text{ sq. rd.} = 4000 \text{ sq. rd.}; \frac{4900}{4000} = \frac{49}{40} \textit{Ans.}$$

$$3. 100 \times (16 \text{ ch.} \times 15) \div 10 \text{ sq. ch.} = \$2400, \text{ cost;}$$

$$\$50 \times (16 \text{ ch.} \times 15 \times 16) \div (6 \text{ rd.} \times 5) = \$6400, \text{ sale;}$$

$$\$6400 \div \$2400 = \$4000, \text{ gain, } \textit{Ans.}$$

$$4. (\$2.75 \times \overline{160 + 40 \times 2}) - (\$2.75 \times 80 \times 4) = \$220 \text{ less, } \textit{Ans.}$$

(790, page 447.)

1. $23040 \text{ A.} \div 288 = 80$; $\frac{80}{640} \text{ A.} = \frac{1}{8} \text{ Sec.}$, *Ans.*
2. $(\frac{1}{2} \text{ mi.} \times 4 \times 320 \div 2 \text{ rd.}) \times 3 \times 6 = 5760 \text{ rails}$;
 $\$40 \times 5.76 = \$230.40$, *Ans.*
3. $\$2.25 \times 320 = \$720$; $\$4.375 \times 160 = \$700$;
 $\$700 - (\$720 \div 2) = \$340$, gain, *Ans.*
4. $160 \text{ A.} + 80 \text{ A.} = 240 \text{ A.}$ $\frac{240}{640} \text{ A.} = \frac{3}{8} \text{ Sec.}$, *Ans.*
5. $\$2 \times 320 = \$640$, purchase; $\$2.75 \times 80 = \$220$;
 $\$3.50 \times 40 = \$140$; $\$3.84 \times 80 = \$307.20$;
 $320 \text{ A.} - (80 \text{ A.} + 40 \text{ A.} + 80 \text{ A.}) = 120 \text{ A. left}$;
 $\$220 + \$140 + \$307.20 - \$640 = \$27.20$, gain, *Ans.*

HALF-SECTION.

N. $\frac{1}{2}$ of S. W. $\frac{1}{4}$ 80 A.	N. W. $\frac{1}{4}$ of S. E. $\frac{1}{4}$ 40 A.	E. $\frac{1}{2}$ of S. E. $\frac{1}{4}$
Remainder of S. $\frac{1}{2}$ of Sec. 4.		80 A.

6. $\$1.25 \times 640 = \$800$, purchase;
 $\$2.50 \times 80 = \$200$; $\$1.75 \times 40 = \$70$;
 $\$2 \times 80 = \$160$; $\$3 \times 20 = \$60$;
 $640 \text{ A.} - (80 \text{ A.} + 40 \text{ A.} + 80 \text{ A.} + 20 \text{ A.}) = 420 \text{ A. left}$;
 $\$2.25 \times 420 = \$945$;
 $\$945 + \$200 + \$70 + \$160 + \$60 - \$800 = \$635$, gain.

SECTION.

	N. E. $\frac{1}{4}$ of N. W. $\frac{1}{4}$ 40 A.		
	W. $\frac{1}{2}$ of S. W. $\frac{1}{4}$ of N. E. $\frac{1}{4}$ 20 A.		
		W. $\frac{1}{2}$ of S. E. $\frac{1}{4}$ 80 A.	
S. $\frac{1}{2}$ of S. W. $\frac{1}{4}$ 80 A.			

(791, page 448.)

2. 5 ft. 3 in. = 63 in.; $(144 \text{ sq. in.} \times 7) \div 63 = 16 \text{ in.}$, *Ans.*
3. $(14 \text{ ft.} \times 3 \times 4 \times 8) \div 12 = 112 \text{ board ft.}$;
 $\$9.50 \times .112 = \$1.064$, *Ans.*
4. $(\overline{1728 \text{ cu. in.} \times 15} \div 10 \times 16) \div 12 = 13\frac{1}{2} \text{ ft.}$, *Ans.*
5. $(\overline{36 \text{ ft.} \times 10 \times 12 \text{ in.} + 9 \text{ in.} \div 2}) \div 12 = 315 \text{ board ft.}$;
 $315 \text{ board ft.} \div 12 = 26\frac{1}{4} \text{ cu. ft.}$, *Ans.*
6. $(\overline{16 \text{ ch.} + 8 \text{ ch.}} \times 4 \times 16\frac{1}{2} \times 2) \div 8 \text{ ft.} = 396 \text{ posts}$;
 $(\overline{16 \text{ ch.} + 8 \text{ ch.}} \times 4 \times 16\frac{1}{2} \times 2) \div 16 \text{ ft.} = 198 \text{ panels}$;

16 ft. $\times (12 + 6 + 9 \times 3) \div 12 = 60$ sq. ft. in a panel ;
 60 sq. ft. $\times 198 = 11880$ sq. ft. lumber ;
 $(\$25 \times 3.96) + (\$14.80 \times 11.88) = \$274.824$, cost, *Ans.*

(793, page 449.)

2. $8 \text{ in.} + (.25 \times 2 \div 2) = 8.25$ in., length ;
 $2 \text{ in.} + (.25 \times 2 \div 2) = 2.25$ in., thickness ;
 $8.25 \text{ in.} \times 2.25 = 18.5625$ sq. in. area ;
 $16.5 \text{ in.} \div 4 = 4.125$ in., width ;
 $18.5625 \text{ sq. in.} \times 4.125 = 76.5703125$ cu. in. in a brick ;
 $1728 \text{ cu. in.} \div 76.5703125 \text{ cu. in.} = 22\frac{3}{4}$ br. in a ft.
 $42 \text{ ft.} \times 24 \times 1\frac{3}{4} \times 22\frac{3}{4} = 31278\frac{6}{11}$ bricks, *Ans.*
3. $(60 \text{ ft.} \times 16.5 \times 1.5) \div 24.75 \text{ cu. ft.} = 60$ Pch., *Ans.*
4. $(120 \text{ ft.} \times 6.75 \times 1.5) \div 24.75 \text{ cu. ft.} = 49\frac{1}{11}$ Pch., *Ans.*
5. $\$.56 \times (240 \text{ ft.} \times 38 \times 8.5) \div 27 \text{ cu. ft.} = \$1607.82$, *Ans.*
6. $(41\frac{1}{4} \times 2 + 33 \times 2) \times 8 \times 1\frac{1}{2} = 1782$ cu. ft. ;
 $1782 \div 22 = 81$ perches ;
 $(41.25 \times 33 \times 8) \div 27 = 403$ loads ; $\$.50 \times 403 = \$201\frac{1}{2}$;
 $\$.375 \times 81 + \$201\frac{1}{2} = \$505.42$, *Ans.*
7. $8.25 + (.25 \times 2 \div 2) = 8.5$ in., length ;
 $2.375 + (.25 \times 2 \div 2) = 2.625$ in., thickness ;
 $8.5 \text{ in.} \times 2.625 = 22.3125$ sq. in., area ;
 $17 \text{ in.} \div 4 = 4.25$ in., width ;
 $22.3125 \text{ sq. in.} \times 4.25 = 94.828125$ cu. in. in a brick ;
 $1728 \text{ cu. in.} \div 94.828125 \text{ cu. in.} = 18.222$ br. in a ft. ;
 $60 \text{ ft.} \times 21\frac{1}{3} \times 1\frac{1}{4} = 1859.375$ cu. ft., in wall ;
 $1859.375 \text{ cu. ft.} \times 18.222 = 33881.53125$ bricks ;
 $\$12.50 \times 33.88153125 = \$423.52$, *Ans.*

8. $37.5 \text{ ft.} \times 9 \times 2 \times 2 = 1350 \text{ cu. ft., sides;}$
 $(26 \text{ ft.} - 2 \text{ ft.}) \times 9 \times 2 \times 2 = 864 \text{ cu. ft., ends;}$
 $1350 \text{ cu. ft.} + 864 \text{ cu. ft.} = 2214 \text{ cu. ft., masonry;}$
 $\$3.85 \times 2214 \text{ cu. ft.} \div 24.75 \text{ cu. ft.} = \$344.40, \text{ cost, } Ans.$

(795, page 451.)

1. $(8 \text{ ft.} \times 6\frac{1}{2} \times 3\frac{1}{2} \times 1728) \div 2150.42 = 139.279 \text{ bu., } Ans$
 3. $(324 \text{ bu.} + 81 \text{ bu.}) \div (6 \times 4.5) = 15 \text{ ft., } Ans.$
 4. $(12 \text{ ft.} \times 3 \times 2.5) - \frac{1}{8} = 72 \text{ bu., barley, } Ans.$
 $72 \text{ bu.} - \frac{1}{8} = 57\frac{7}{8} \text{ bu., apples, } Ans.$
 5. $\$2 \times (20 \text{ ft.} \times 12 \times 5 - \frac{1}{8}) = \$1920, Ans.$
 6. $\$1.375 \times (7 \text{ ft.} \times 6 \times 5 - \frac{1}{8}) \times \frac{3}{4} = \$173.25, Ans.$
 7. $(15 \text{ ft.} \times 7\frac{1}{2} \times 8 - \frac{1}{8}) - \frac{1}{8} = 563\frac{1}{8} \text{ bu. of ears;}$
 $\$.92 \times 563\frac{1}{8} \div 2 = \$259.072, Ans.$
 8. $(10 \text{ ft.} \times 5 \times 4) - \frac{1}{8} = 160 \text{ bu.};$
 $48 \text{ lb.} \times 160 \div 196 \text{ lb.} = 39\frac{2}{7} \text{ bbl., } Ans.$
 9. $\$1.50 \times 12400 = \$18600, \text{ cost;}$
 $(12400 \text{ bu.} \div 8 \text{ bu.}) \times 6 = 9300\text{s., freight;}$
 $(12400 \text{ bu.} \times 60 \div 100) \times 12 = 89280\text{s.};$
 $(89280\text{s.} - 9300\text{s.} \div 20\text{s.}) \times 4.8665 = \$19461.1335;$
 $\$19461.1335 - \$18600 = \$861.13 \text{ gain, } Ans.$

(796, page 452.)

2. $(48 \text{ hhd.} \times 63 \times 231) \div 1728 \text{ cu. in.} = 404\frac{1}{4} \text{ cu. ft., } Ans.$
 3. $(11 \text{ ft.} \times 6 \times 7 \times 1728 \div 231 \text{ cu. in.}) \div 63 \text{ gal.} = 54\frac{2}{3} \text{ hhd., } Ans.$
 4. $(22.5 \text{ ft.} \times 3.25 \times 6.4 \times 1728) \div 231 \text{ cu. in.} = 3500\frac{2}{3} \text{ gal., } Ans.$
 5. $(32 \text{ hhd.} \times 63 \times 231) \div (6 \text{ ft.} \times 8 \times 144) = 5 \text{ ft. } 7\frac{1}{2} \text{ in.}$

6. $(6.5 \text{ ft.} \times 4 \times 3.5 \times 1728) \div 231 \text{ cu. in.} = 680\frac{8}{11} \text{ gal.};$
 $8\frac{1}{2} \text{ lb.} \times 680\frac{8}{11} = 5672\frac{8}{11} \text{ pounds, } \textit{Ans.}$
7. $(67.2 \text{ cu. in.} \times 64) - (57.75 \text{ cu. in.} \times 64) = 604.8 \text{ cu. in.}$
8. $10 \text{ bu.} \times 2150.42 = 21504.2 \text{ cu. in.};$
 $(\$.25 \times 21504.2 \text{ cu. in.} \div 57.75 \text{ cu. in.}) - (\$5 \times 10) =$
 $\$43.09, \textit{Ans.}$
9. $(5 \text{ ft.} \times 4 \times 3 \times 1728) \div 231 \text{ cu. in.} = 448\frac{8}{11} \text{ gal.};$
 $1 \text{ hr. } 30 \text{ min.} = 90 \text{ min.}; 448\frac{8}{11} \div 90 = 47\frac{8}{11} \text{ gal., } \textit{Ans.}$
10. $(5000 \text{ gal.} \times 4 \times 57\frac{3}{4}) \div (67\frac{1}{2} \text{ cu. in.} \times 8 \times 4) = 537\frac{7}{8} \text{ bu.,}$
 $\textit{Ans.}$
11. $(40 \text{ ft.} \times 20 \times 8 \times 1728 \div 2) \div 231 \text{ cu. in.} = 23937.66$
 $\text{gal.}; \$.06 \times (23937.66 \text{ gal.} \div 63 \text{ gal.}) = \$22.797,$
 $\textit{Ans.}$
12. $24\frac{3}{8} \text{ ft.} \times 12\frac{3}{4} = 314\frac{1}{2} \text{ cu. ft.};$
 $314.5 \text{ cu. ft.} \times 1728 \div 231 \text{ cu. in.} = 2352\frac{4}{11} \text{ gal., } \textit{Ans.}$

NOTE.—Such changes have been made in this Key as will make it harmonize with the editions of the Higher Arithmetic printed since 1875.

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